West End Mixed-use Development
Schematic Design Narrative

Traverse City

100% Schematic Design

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March 20, 2024
Fishbeck Project No. 231082

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1.0 Project Introduction 1
1.1 Parking Structure Description 1
1.2 A/B Building Description 5
1.3 State Street Liner Building Description 5
1.4 Codes, Standards, Accessibility, and Zoning Requirements 6
1.5 Green Building Initiatives 6
1.6 Future Coordination Items 7

2.0 Parking Structure Systems 9
2.1 Interior Architecture 9
2.1.1 Concrete Stain 9
2.1.2 Signage 9
2.2 Structural and Durability Design Criteria 10
2.3 Elevators 11
2.4 Fire Protection 12
2.5 Plumbing 12
2.5.1 Sanitary 12
2.5.2 Storm 12
2.5.3 Domestic Water 12
2.5.4 Natural Gas 12
2.5.5 Piping Systems 13
2.6 Mechanical 13
2.6.1 Operations Spaces 13
2.6.2 Parking Garage Ventilation 13
2.6.3 Hydronic Snowmelt System 13
2.6.4 Elevator Hoistway and Control Room HVAC 13
2.6.5 IT Closet HVAC 13
2.6.6 Electrical Room HVAC 13
2.6.7 Water Room HVAC 14
2.6.8 System Controls 14
2.7 Electrical 14
2.7.1 Normal Power Electrical Service 14
2.7.2 Emergency Power for New Parking Ramp 15
2.7.3 Conduit, Back Boxes, Conduit Supports 15
2.7.4 Normal Power Distribution Systems 15
2.7.5 Power Quality, Grounding and Bonding and Lightning Protection System 16
2.7.6 Motor Controls 16
2.7.7 Electrical Identification 16
2.7.8 Interior Lighting 16
2.7.9 Exterior Lighting (Parking Ramp Building Perimeter) 17
2.7.10 Fire Alarm System 17
2.7.11 Communication Systems 17
2.7.12 Security Cameras and Access Control Equipment 18
2.7.13 Parking Access and Revenue Control (PARCS) Systems 18
2.7.14 Electric Vehicle Charging Stations 18

3.0 A/B Building Systems 18
3.1 Structural System 18
3.2 Architectural 19
3.3 Fire Protection 20
3.4 Plumbing 20
3.5 Mechanical 21
3.6 Electrical 23
3.7 Fire Alarm 24

4.0 State Street Liner Building Systems 24
4.1 Structural System 24
4.2 Architectural 24
4.3 Fire Protection 25
4.4 Plumbing 26
4.5 Mechanical 27
4.6 Electrical 28
4.7 Fire Alarm Systems 29

5.0 Site (Civil, Utilities, and Landscape) 30
5.1 Layout 30
5.2 Utilities 30
5.2.1 Water 30
5.2.2 Sanitary 30
5.2.3 Electrical 31
5.2.4 Stormwater Management 31
5.2.5 Existing Soil Conditions 31
5.2.6 Landscape 31

6.0 Traffic Impact Study 31

7.0 Estimate of Probable Construction Cost 33

8.0 Building Code Summary 34
8.1 Parking Structure Code Analysis 34

List of Tables

Table 1 – Total Project Estimate of Probable Design and Construction Cost 33
Table 2 – Parking Structure Code Analysis 35

List of Appendices

Appendix 1 Schematic Design Drawings
Appendix 2 Geotechnical Evaluation Report
Appendix 3 Stormwater Design Narrative
Appendix 4 Traffic Impact Study
Appendix 5 Program Estimate of Probable Cost
Appendix 6 Utility Services Comparison – Conventional versus Electric Only
Appendix 7 Rendered Site Plan

List of Abbreviations/Acronyms

A	Amperes
AASHTO	American Association of Highway and Transportation Officials
ACI	American Concrete Institute
ADA	Americans with Disabilities Act
AHJ	Authority Having Jurisdiction
AHU	Air Handling Unit
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
ANSI	American National Standards Institute
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASR	Alkali-silica Reaction
ASTM	American Society for Testing and Materials
AV	Audio/Visual
BMS	Building Management System
CW	Cold Water
cy	Cubic Yards
DB	Dry Bulb
DDA	Downtown Development Authority
DLC	DesignLights Consortium
DOT	Department of Transportation
EMT	Electrical Metallic Tubing
EPS	Expanded Polystyrene Insulation
EVCS	Electric Vehicle Charging Station
F	Fahrenheit
FDC	Fire Department Connection
FHWA	Federal Highway Administration
gal	Gallons
GFI	Ground Fault Circuit Interrupter
GGBS	Ground Granulated Blast Furnace Slag
HCM	Highway Capacity Manual
HVAC	Heating, Ventilation, and Air Conditioning
HW	Hot Water
HWR	Hot Water Return
IBC	International Building Code
ICC	International Code Council
IES	Illuminating Engineering Society
IESNA	Illuminating Engineering Society of North America
IFC	International Fire Code
kW	Kilowatt
LED	Light Emitting Diode
LOS	Level of Service
MBC	Michigan Building Code
MC	Metal Clad
MEC	Michigan Energy Code
MMC	Michigan Mechanical Code
MRL	Machine Room Less
NEC	National Electrical Code
NEMA	The National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NM	Non-metallic
PARCS	Parking Access and Revenue Control System
PCI	Precast/Prestressed Concrete Institute
PLC	Programmable Logic Controller
psf	Pounds per Square Foot
psi	Pound-force per Square Inch
PVC	Polyvinyl Chloride
PVCDWV	Polyvinyl Chloride Drain, Waste and Vent
RMC	Ready Mixed Concrete
SER	Aluminum Service Entrance Cable
sf	Square Foot/Feet
TERS	Temporary Earth Retention System
TR	Tamper-Resistant
UPS	Uninterruptible Power Supply
V	Volts
VFD	Variable Frequency Drive
WB	Wet Bulb
w.c.	Water Column

1.0 Project Introduction

This mixed-use development project is intended to address two primary objectives based on the needs of the community. The first objective is to provide new attainable housing (80-120% of Area Median Income) to address a shortage in this sector of the residential market. The second objective is to provide structured parking to facilitate best land use, improve the pedestrian experience, and promote economic development in the City's downtown. The scope includes three new structures: A-B Building, State Street Liner Building, and the new Parking Structure. The first two structures address the housing need and include street level activation elements, and the latter addresses the parking need.

The project is located near the west end of Traverse City's primary commercial downtown area. Once constructed, the public parking facility will effectively bookend the commercial district with the existing Hardy Deck on the east end and Old Town parking structure to the south. The specific project site is bounded by Pine Street to the west, State Street to the south, and the public alley on the north. The project site does not include the 134 West State Street lot, which is privately owned.

The existing buildings and parking lot currently in existence on the project site will be demolished in advance of the new construction, and the known environmental contaminants will be remediated. Both the demolition and the environmental remediation work will be specified by others outside the scope of this project.

The exterior architecture of the structures is designed to be in compliance with City ordinances and blend with the character of the historic downtown environment. The A-B Building and the State Street Liner Building, which have public street frontage, contain design elements intended to provide active use at grade level, with residential units provided at the upper floors.

1.1 Parking Structure Description

A. Parking Structure Concept:
   1. Refer to Appendix 1 for the parking structure's schematic design drawings.
   2. Summary of parking functional features:
      a. The schematic design allows for 534 parking spaces to be provided over six parking levels. Support rooms have been shown schematically. A reduction in the number of parking spaces shown should be anticipated during further design development. This is typically due to establishing the exact needs, locations, and dimension of support rooms and spaces.
      b. Two-bay structure with both bays ramped and single helix circulation.
      c. Eleven accessible parking spaces, of which, two are designated van accessible spaces.
      d. Van ADA spaces are located at the east end of Level 1 where there is sufficient headroom greater than 8'-2", which will be signed at the entry/exit lanes.
      e. Electric vehicle charging stations are anticipated. Eight EVCS spaces are shown, of which, seven are standard spaces and one is an ADA space, but this quantity may be adjusted during further design development.
      f. Thirteen spaces are programmed to be signed as alternative or low-emitting vehicles only.
      g. 90-degree parking with two-way traffic.
      h. Typical parking spaces are 9'-0" wide x 18'-0" long.
      i. Typical upper level floor-to-floor height is 11'-0", which allows for 8'-0" of structural headroom and will be signed as 7'-8" clear.
      j. The parking structure will be designed for future vertical expansion of two floors. If constructed similar to the currently proposed layout, the total parking count would be approximately 728 spaces.

B. Multiple user groups, consisting of residential permit holders, commercial permit holders, and visitors, are anticipated. No physical gates or separation of user groups (referred to as nesting) is anticipated. No special signage or space designation will be provided. All users will comingle and park in any available parking space.

C. The parking geometrics proposed will provide a level of service (LOS) between LOS A and LOS B. The level of service is a design criteria based on industry standards, with A being the best (very good, most users satisfied) and D being the worst (less than 50% of users satisfied). Considering the mix of users anticipated, the LOS A/B is appropriate.

D. Access Lanes: A total of one dedicated entry lane, one dedicated exit lane, and one reversable lane are being provided with all vehicular access to the parking structure via the public alley.

E. Parking Access and Revenue Control (PARCS) Equipment:
   1. In-lane PARCS equipment will be provided for the four lanes identified above and detailed below.
   2. Each entry lane will have an entry terminal, including a ticket spitter, card reader, intercom, and gate arm.
   3. Permit holders are anticipated to utilize the card readers to scan their valid credentials.
   4. Visitors will be required to pull a ticket upon entry and pay for their parking session prior to returning to their vehicles, utilizing one of two pay-on-foot stations located at grade level of the two stair towers, which are the primary pedestrian access points. The pay-on-foot station located at the southeast stair will be equipped to handle cash and credit card transactions. The station at the northwest stair will be equipped to process credit card transactions only (no cash).
   5. The in-lane exit stations will contain a card reader, an intercom, exit verification, gate arm, and be equipped to process credit card transactions for visitors that do not utilize the pay-on-foot stations. No provision for in-lane cash transactions will be provided.

F. Vehicle ramping has been designed to allow vehicles to circulate through the structure efficiently. Both bays are ramped with ramp slopes less than 5%. The levels have been assigned Level 1 for grade level, then numerically increasing up to Level 6, which is the top level. There is no basement or any partially below grade parking being provided.

G. Parking Office Space:
   1. Approximately 800 square feet (sf) of open office space is provided at Level 1 of the parking structure. This space is intended to accommodate workstations for some Parking staff being assigned to this space, as well as temporary staff that may be present during special circumstances or events.
   2. One accessible, unisex restroom is being provided for staff use.
   3. A break area is being provided, which will contain cabinets, countertops, a kitchen sink, and space for a refrigerator and a microwave oven.
   4. The janitor's closet will include a service sink and provide storage space for cleaning and maintenance products.
   5. A small technology closet is being provided to house computer network equipment supporting the parking office and the operations of the parking structure.
   6. The space will be climate controlled with interior finishes appropriate for office space.
   7. Windows looking out at the vehicular entry/exit will be one-way glass.
   8. Office furniture and workstations themselves are not included in this project.
   9. Although one of the pay-on-foot stations will accept cash payments, there is no dedicated money count room or safe anticipated.

H. Parking Structure Electrical and IT Rooms: The main electrical room and emergency electrical room will be provided at Level 1. Rooms will be constructed with concrete and masonry block and will be provided with locking doors, physical versus electronic access will be coordinated during design development. Heat and ventilation will be provided as required. Additional space is available for IT/COMM and electrical distribution rooms of similar construction at Levels 2-6, specifically in the southwest and northeast corners.

I. Security Systems:
   1. Passive security is a primary design element of the parking structure. Glass in stair towers, glass-backed elevators, uniform lighting, design to maximize line-of-sight for users (minimize visual obstructions), and good visibility are all components of a design for safety.
   2. Active security elements, including cameras and blue light (emergency) phones, are planned. The exact quantity, type, and location of security cameras will be determined during design development. The blue light phones are anticipated near each elevator lobby.

J. Stair and Elevator Towers:
   1. The parking structure contains one combination stair and elevator tower located at the northwest corner.
      a. This stair/elevator is a shared egress route with the adjacent A/B Building. As such, it is constructed to be enclosed and of fire rated construction as required by building code.
      b. Because the floor elevation at the northwest corner of the parking structure is several feet higher than the site grade at the alley, the stair has an additional run, and the elevator is provided with a rear stop at alley level.
   2. For the second means of egress from the parking structure, access to the State Street Liner Building, through a fire-rated door, is provided near the southeast corner of the parking structure. The Liner Building has a stair and elevator that will be shared with the residents of the building and the parking structure.
   3. For convenience, the parking structure has an access door to the State Street Liner Building near the southwest corner at each parking level. This will allow residents to access the west end of the Liner Building and its stair. This access point is not a code-required exit from the parking structure.

K. Signage:
   1. Exterior signage will identify the structure and the entrance and exit.
   2. Because of the reversible lane, LED “x” and “arrow” signs will be provided at the entry/exit, which will change based on the functional direction of the reversible lane to indicate to patrons which lanes are available for use for entering and exiting.
   3. Interior signage will be provided at the stair and elevator towers, accessible parking spaces, small car only parking spaces, electric vehicle charging spaces, vehicular exiting route, vehicular parking route, and pedestrian directional signage to primary destinations.
   4. The height restriction bars (head-knockers) will indicate allowable headroom clearance.
   5. Signage for exiting vehicles will direct generally northbound traffic to turn left to drive westward in the alley for a right-hand turn onto Pine Street. And generally southbound traffic to turn right to drive eastward in the alley for a right-hand turn onto Union Street.
   6. Although not part of the parking structure, there will be a canopy style gateway signage at the west end of the alley indicating public parking. The sign will be supported on the A-B Building, thereby eliminating the need for foundation and obstructions that a ground-mounted option may entail. It is anticipated that the west end of the alley will be the primary vehicular approach path to the structure’s entry.

L. Snowmelt Systems:
   1. The project includes snowmelt systems at four primary locations described below.
      a. A/B Building Sidewalk – The at-grade sidewalk on Pine Street frontage contains snowmelt system. The boiler for this snowmelt system is housed in a mechanical room at grade in the A/B Building.
      b. Liner Building Sidewalk – The at-grade sidewalk on State Street frontage contains snowmelt system. The boiler for this snowmelt system is housed in a mechanical room at the southwest corner of Level 1 in the parking structure.
      c. Parking Structure East Walk and Entry/Exit – The at-grade sidewalk on the east side of the parking structure and the vehicular entry/exit lanes contains snowmelt system. The boiler for this snowmelt system is housed in a mechanical room at the east end of Level 1 in the parking structure.

   d. Parking Structure Roof – The entire supported slab of the Level 6 and portion of Level 5 open to above will have a snowmelt system consisting of an insulated, heated topping slab with a waterproofing membrane applied to the structural slab. The space requirements to house the boilers and pumps for this size of system is significant and will require further design development to establish. The intention would be to utilize available space, provide enclosures as necessary, while minimizing the displacement of parking spaces.
2. Due to the ordinance-mandated prohibition on new natural gas service, the boilers for all of the snowmelt systems are electric. The electrical energy demand for the electric boilers, especially the roof level of the parking structure, is very large. Additional options to eliminate the snowmelt from the parking structure's top level area will be considered as part of further design development.
3. One alternative may be to provide a photovoltaic array above the top parking area. The photovoltaic array would shield the parking area from direct precipitation, thereby eliminating the need for the snowmelt system while simultaneously providing some power generation capacity. The electrical power from this system could be used by building systems to reduce the power consumption from the main electric service.

M. Roof Level Snow Removal:
1. As currently anticipated in schematic design, the roof level is provided with an electric boiler snowmelt system. The electric boilers are used to heat glycol-treated (antifreeze) water, which circulates through a network of closed loop tubing that is embedded in the concrete slab driving surface. Heat is transmitted from the glycol to the concrete slab, which in turn melts snow and ice on the slab surface. Melt water then flows by gravity to the stormwater drainage system.
2. With the roof level being provided with a snowmelt system, the need for plowing snow and applying deicing chemicals is anticipated to be nearly non-existent. Some amount of indirect precipitation, at both the roof and lower levels, should still be anticipated, which may require localized treatment.
3. A snow chute is also provided for occasional, emergency use in the event that the snowmelt system is not functioning. It would also serve for snow removal operations if the snowmelt system is removed in the design development phase. The snow chute is located just east of the northwest stair/elevator tower. It has entry doors on the south side of the shaft at Levels 5 and 6 and discharges out the north shaft wall to the alley where snow would need to be captured and hauled away by truck.
4. One additional operational possibility may be to seasonally close all or a large portion the roof level to parking. Roof level parking is typically considered the least desirable and the last to be occupied. If seasonal parking demand is less in the winter than in peak summer months, the roof level spaces may not be needed, and snow may be safely allowed to remain unplowed on the closed roof area.

N. Vehicular and Pedestrian Barriers, Security, and Jump Deterrent Fencing:
1. Two exterior sides, the west and south, are solid precast concrete walls, as mandated by building code for fire separation to adjacent structures and lot lines.
2. The north exterior fronts the alley and to maximize openness, the pedestrian and vehicular barrier is an 11-cable barrier strand system.
3. The east exterior is purposefully held greater than 10-feet off the neighboring property so that openings can be allowed. Precast concrete spandrels provide the vehicular and pedestrian barrier at this side. The structural shear wall is also located at this perimeter and is provided with punched openings to allow for increased openness.
4. At upper levels, jump deterrent fencing above the pedestrian/vehicular barriers is not included. Although not explicitly designed for this purpose, the architectural fabric façade system being proposed on the north and east sides of the parking structure may serve a similar purpose.
5. Security enclosure fencing at grade level is not included.
6. Pedestrian and vehicular protection at the interior ramp dividing wall, anticipated to be a precast lite-wall, will be provided by fence infill within the lite-wall openings.

O. Bicycle Parking:
   1. Bicycle parking will be provided at two primary locations. The first is in the mobility hub space housed in the State Street Liner Building. The mobility hub will provide indoor, secure (via card reader access) bicycle storage, as well as men's and women's shower and locker room space.
   2. In addition to the mobility hub, non-secure bicycle storage will be provided at Level 1 near the vehicular entry. Floor-mounted bicycle hoops and wall-mounted racks will be provided as space permits. Although non-secure, the visible location and proximity to the Parking Office space are factors that improve the security of bicycles in this area.

P. Motorcycle Parking:
   1. Motorcycle parking is not anticipated but may be incorporated based on user input and further design development.

Q. Future Expansion:
   1. The structure will be designed to accommodate a future vertical expansion of two parking levels.
   2. Foundations supporting the parking structure will be designed with sufficient capacity to support the future vertical expansion.
   3. The structure will not be explicitly designed for a future roof or photovoltaic array. However, a future roof or photovoltaic array would be expected to fall within the design allowance for one of the levels of future vertical expansion.

R. Miscellaneous Considerations:
   1. The parking structure's superstructure will be structurally separated from the two adjacent buildings with a properly sized, engineered expansion joint. The parking structure will also share foundations with each of the two adjacent buildings.
   2. Birds, specifically seagulls, are a known nuisance in this area. Detailing will consider the need to minimize the possible roosting places for birds. Bird friendly glazing will be provided at the stair and elevator towers to minimize the chances of bird death due to impact.

1.2 A/B Building Description

The five-story A/B building is located on the corner of Pine Street and the alley. The building abuts the west side of the proposed West End Parking Deck and utilizes the parking deck elevator and stair tower. The First Floor includes "white box" Commercial/Retail space, two ADA accessible one-bedroom/one bath apartments, as well as Laundry & Trash Room for upper-level residential units. The upper four levels of the A/B Building include 24 residential units. Each floor has six one-bedroom/one bath units that range from 420 to 505 sf.

1.3 State Street Liner Building Description

The five-story Liner Building is located on the 100 block of West State Street and abuts the south side of the proposed West End Parking Deck. The First Floor includes a Mobility Hub, Laundry & Trash Room for upper-level residential units, as well as "white box" commercial/retail tenant space that can accommodate a variety of sizes and use. The upper four levels of the Liner Building include 56 residential units. Each floor has 14 units that range from 430 sf one-bedroom studios to 680 sf two bedroom, two bath apartments.

1.4 Codes, Standards, Accessibility, and Zoning Requirements

A. Below are the currently applicable codes and standards. It should be noted that the State of Michigan and the City of Traverse City may revise their codes and ordinances prior to this project being submitted for permitting. The applicable codes will need to be reevaluated during later design phases of this project.
   1. Building: 2015 Michigan Building Code (MBC) – The Michigan Building Code is based on the 2015 International Building Code with Amendments
   2. Mechanical: 2015 Michigan Mechanical Code (MMC)
   3. Plumbing: 2018 International Plumbing Code with Part 7 Plumbing Code Michigan Amendments
   4. Electrical: 2017 National Electrical Code (NEC) with Michigan Part 8 Changes
   5. Energy: 2015 Michigan Energy Code (MEC) and referenced ANSI/ASHRAE/IESNA 90.1-2013
   6. Fire: 2018 International Fire Code (IFC)
   7. Elevator: 2010 ASME A17.1 Safety Code for Elevators and Escalators, 2011 ASME A18.1 Safety Standard for Platform Lifts and Stairway Chairlifts, 2009 ASME A90.1 Safety Standard for Belt Manlifts, Elevator Safety Board General Rules
   8. Accessibility: 2009 Accessibility and Usable Buildings and Facilities ICC A117.1-2009 per 2015 MBC
   9. Durability Standards: Durability will meet or exceed American Concrete Institute recommendations (ACI 362)
   10. Fair Housing Act
   11. Enterprise Green Communities: Residential Appliances
   12. Mechanical: ASHRAE Standard 62.1-2013 Ventilation for Acceptable Indoor Air Quality and ASHRAE Standard 62.2: Ventilation for Acceptable Indoor Air Quality in Residential Buildings.
   13. Other Applicable Criteria: Primary applicable criteria includes Industry Criteria – AASHTO; ACI (318, 315, 530); ADA (28 CFR Part 36); AISC; AISI; ANSI (including National Electrical Safety Code); ASCE (7: loads, 37: san/storm, 31-03: seismic existing building, 41-06: seismc rehab); ASME (A17.1 Elevators); ASTM; FHWA; IES; IBC; NFPA; PCI (PCI Handbook); State/Local – DOT, Sediment/Erosion Control, Environmental Control, Storm Water Management

B. Zoning: The project is located in the C-4c Regional Center zoning district. The project does not abut or sit across a public alley from an R-district (residential). The building minimum setback requirements for this site are as follows: Side, none; Rear, none; and Front, 2.5-feet. The buildings are being designed to fall below a 60-feet maximum height. Select elements, such as the stair/elevator towers, parapet walls, and electrical equipment, may be taller, as allowed by ordinance.

1.5 Green Building Initiatives

The proposed Traverse City West End Mixed-use project is designed with improved environmental performance in the following five major categories:

A. Sustainable Sites:
   1. Stormwater Design:
      a. Roof rainwater is collected and directed to underground infiltration system.
      b. Option to replace the Alley pavement with permeable pavers.
      c. Building will meet/exceed Traverse City's stormwater ordinance.
   2. Heat Island Reduction:
      a. Use of white and light-colored heat-reflecting Roof Materials.
      b. Light Pollution Reduction through use of dark sky exterior lighting fixtures.

B. Water Efficiency:
   1. Water Use Reduction: 30% reduction over normal use.
      a. Water efficient plumbing fixtures will be utilized.
   2. Water Efficient Landscaping:
      a. Native plants requiring little to no irrigation will be specified where landscaping is provided.

C. Energy and Atmosphere:
   1. Optimized Energy Performance: Over 25% reduction as compared to normal use.
      a. Energy efficient HVAC systems will be utilized.
      b. 100% of the building's energy will be supplied by electricity.
      c. Natural daylighting will be optimized.
      d. Lighting control systems that automatically turn lights off or dim when the space is not occupied.
      e. All lighting will be LED lighting.
      f. Option to provide photovoltaic solar array above the parking structure.

D. Materials and Resources:
   1. 75% of construction waste will be diverted from landfills.
   2. Building materials with recycled content will be utilized.
   3. Over 20% of all building materials will be processed or manufactured regionally.
   4. All wood will be from Sustainable Forests.

E. Indoor Environmental Quality:
   1. Preventive Practices:
      a. Environmental Tobacco Smoke Control – During construction until present time.
      b. Construction Indoor Air Quality Control – Both during construction and reinforced with a whole-building air purge at construction completion.
      c. Monitoring of Outdoor Air Delivery.
   2. Use of Low-Emitting Materials for all:
      a. Adhesives, sealants, paints, flooring, and composite wood.
      b. Outdoor views are provided for 90% of spaces.

F. Pertaining specifically to the parking structure, Parksmart is a parking and mobility industry certification program administered by the Green Business Certification, Inc. (formerly the US Green Building Council) that promotes sustainability in parking structure design and operation. Similar to the LEED certification program for buildings, points are assigned for incorporating design features and operational practices and the tiered level of certification is achieved based on point ranges: Bronze (110 to 134 points), Silver (135 to 159 points), or Gold (160+ points). Parksmart certification is anticipated for this project.

1.6 Future Coordination Items

The below items are included to highlight the need for further coordination during design development.

A. City Engineering:
   1. The traffic impact study indicated the need for changes to two intersections to accommodate future traffic volumes. Specifically, eastbound State Street at Union (eliminate the pedestrian bump-outs and separate lanes for through traffic and left turns) and westbound Front at Pine (separate lanes for through traffic and left turns).
   2. Determine who is performing the direct coordination with the utility companies for the undergrounding of the overhead utilities that exist in the alleys. The companies believed to have overhead infrastructure are:
      a. Traverse City Light and Power
      b. AT&T

c. Extenet
d. PFN, and
e. Spectrum/Charter

3. Explore the possibility of engaging a construction manager for all or portions of the development.

B. Fire Marshall:
1. Building address preference in assigning.
a. There is no public street frontage for the proposed parking structure.
b. Initial thoughts are to assign a State Street address or assign an alley address.
2. Verify preference on Fire Department connection locations.
a. A-B Building: On west building face.
b. State Street Liner Building: On south building face near east end (this will require new fire hydrant, which is planned).
c. Parking Structure:
1) One next to the State Street FDC (State Street Liner building face).
2) One additional at northwest stair/elevator. Note that this one does not fall close enough to existing fire hydrant but could be available for use if necessary. This FDC would be interconnected with the State Street FDC for the standpipe system.
3. Fire Extinguishers:
a. Code language requires these at 75-foot spacing.
b. Extinguishers require inspection/maintenance and can become targets of theft and vandalism.
c. Code commentary indicates trained building personnel are assumed to be onsite to use the fire extinguishers. This may typically not be the case in public parking facilities. It is also debatable if it is desired for parking garage patrons to attempt to extinguish a car fire (evacuation may be more prudent).
d. Verify direction if fire extinguishers may be provided only inside service rooms and not in the general public parking areas.
4. Signal Boosters:
a. All three buildings are entirely above grade and parking structure is “open”.
b. What is procedure for evaluating if this is required?

C. Environmental Remediation Project:
1. The environmental project will likely require the occupied spaces of the new structures to be provided with vapor mitigation systems. These systems are anticipated to be designed by Otwell Mawby and funded through the EGLE grant (if funds remain available).
2. The soil removal and replacement portion of the EGLE-funded remediation should include tight control of backfill and compaction. If documentation is not provided, then the fill would necessarily be classified as undocumented fill and may not support the design foundation loads indicated in the Geotechnical Evaluation Report.
3. A fully designed temporary earth retention system may be desirable to include in the soil removal project scope (by Otwell Mawby) that may be utilized not only for the soil removal and replacement but the subsequent foundation excavation for the development.

D. Geotechnical:
1. Following the environmental work, SME has requested that they be retained to perform follow-up pressure meter testing in the areas disturbed by the environmental project to validate the allowable foundation loads.

E. Snowmelt Systems:
   1. The snowmelt system at the roof level would require a large electrical energy demand to operate. Additional value engineering options should be considered to eliminate this system partially or wholly.
      a. If the snowmelt system was wholly eliminated, then the snow chute could be used as the sole means of snow removal, which is consistent with current operations at Traverse City's other two parking structures. This scenario would require snow removal operation at roof level to dump into the chute and trucking from the alley at grade level after the snow is discharged from the chute.
      b. A second option would be to provide a photovoltaic array above the roof level of parking. The photovoltaic array, which could be mounted to a roof deck, would intercept most of the direct precipitation. Without significant direct precipitation, the need of snow removal at the parking level would be greatly minimized; there may be limited efforts required for indirect, blown in precipitation as typical for other covered levels. Conformance with ordinances, specifically with respect to building heights and allowable rooftop projections (e.g., considering the photovoltaic array as rooftop equipment).

F. Liner and A-B Building Structural System:
   1. In the sections below, the building system is described as precast plank supported on CMU bearing walls and structural steel framing. Further design development should include evaluating this in comparison to an all-precast building system. Specifically, insulated precast wall panels may be more efficient to construct than the CMU bearing walls. And precast beams and columns may be an economical substitute for the structural steel framing. The primary advantage for considering an all-precast structure is to limit the number of design and construction trades involved in erecting the buildings.

2.0 Parking Structure Systems

2.1 Interior Architecture

2.1.1 Concrete Stain

A white concrete stain will be applied to the underside and interior faces of all slabs, beams, and spandrels. If economy does not allow for this, it may be reevaluated during further design development.

2.1.2 Signage

A. Indicate parking structure designation on exterior at entrance.

B. Indicate wayfinding and exiting.

C. Label floors.

D. Label stairs and elevator cores.

E. Designate stair number and floor inside and outside of each level.

F. Label all rooms.

G. Provide wayfinding to ADA and EVCS parking spaces.

H. Provide overhead clearance indicators at entrance, including overhead bumper tube.

I. In coordination with equipment locations and operations, signage directing visitors to utilize pay-by-license plate stations.

2.2 Structural and Durability Design Criteria

A. Structural System: The structural system will be precast, field topped concrete. The structural system will be designed and detailed to accommodate anticipated volume changes from concrete drying shrinkage, elastic shortening, creep, and temperature changes.

B. The precast fabricator and erector shall be PCI Certified. The design of the precast shall meet ACI 318 and PCI MNL 120 design standards. The fabrication and quality control of the precast shall meet PCI MNL 117.

C. Foundations:
   1. The foundation system will be based on recommendations from the geotechnical engineer. Refer to Appendix 2 for the Geotechnical Evaluation Report.
   2. The foundation system is anticipated to be on spread footings with a net allowable bearing pressure of 8,000-PSF.
   3. Due to the presence of structures on adjacent properties, project requirements for noise and vibration settlement should be incorporated into the project.
   4. A temporary earth retention system (TERS) will be required for foundation excavation adjacent to property and lot lines. There may be an opportunity to coordinate with the separate environmental project to utilize a TERS that could remain in place for both projects. Further coordination with the environmental project will be required.
   5. An underground pretreatment unit and stormwater detention system is anticipated, and the location of this system will be coordinated with foundations.
   6. An underground sanitary treatment structure (sand-oil separator) is anticipated, and location will be coordinated with foundations.

D. Slab-on-Grade: The slab-on-grade will be a 5-inch concrete slab over a compacted sub-base recommended by the geotechnical engineer. The slab-on-grade will be reinforced and jointed to reduce concrete cracking. It is anticipated that a vapor mitigation system will be installed below the slab in enclosed rooms and occupied areas.

E. Parking Structure Durability Criteria: The following durability criterion outlined in ACI 362, along with Fishbeck's recommended durability requirements, will be used for the parking structure:
   1. Precast, Pre-tensioned Concrete with Field Topping: Precast pre-tensioned structural floor system with minimum 2-inch-thick double tee flange and a 3-inch minimum cast-in-place concrete topping.
   2. The following durability requirements are recommended by Fishbeck for a durable parking structure, with a 50-year service life.
      a. Drainage: Parking areas should have a positive floor slope of 1.5% to 2% in all directions, with consideration for ADA parking and access routes.
      b. Cast-in-Place Concrete Quality:
         1) Maximum 0.40 water/cement ratio.
         2) Minimum 5,000 psi at 28 days.
         3) Air entrained concrete (6-1/2% +/- 2%).
         4) Calcium Nitrite Corrosion Inhibitor (3 gal/cy).
         5) Admixtures to reduce long-term permeability, such as fly ash and ground granulated blast-furnace slag (GGBS).
         6) Aggregate (coarse and fine) that meets ASTM C33 5S requirements and confirmed not susceptible to ASR.
      c. Precast Concrete Quality:
         1) Maximum 0.38 water/cement ratio.
         2) Minimum 5,000 psi at 28 days.
         3) Air entrained concrete (6-1/2% +/- 2%).

4) Calcium Nitrite Corrosion Inhibitor (2 gal/cy for beams, tees, walls, columns, spandrels, and other vertical elements).
5) Aggregate (coarse and fine) that meets ASTM C33 5S requirements and confirmed not susceptible to ASR.
6) Precast: Stainless steel connectors; hot dip galvanized exposed plates.

d. Concrete Placement: Cast-in-place concrete placement and curing procedures to include 7-day wet cure.
e. Concrete Structure Detailing:
   1) Concrete Cover: To be specified based on fire rating and durability requirements.
   2) Restraint: Structural restraint of concrete shrinkage, elastic shortening, and volume change will result in cracking. Structural detailing to address potential restraint at exterior walls, interior walls, stair cores, etc.
f. Reinforcing Steel:
   1) Slab epoxy coated steel to be used for cast-in-place topping.
   2) Epoxy coated steel to be used in precast for reinforcement that extends into the cast-in-place topping slab. Black (uncoated) steel to be used in all other precast construction.
   3) Precast double tees, beams, and spandrel elements to be prestressed.
g. Miscellaneous Steel:
   1) Miscellaneous steel in the parking structure, including embedded plates, anchorages, connection hardware, structural steel, handrails, fencing, etc. is to be hot dip galvanized (or stainless). Some elements may require a topcoat of paint for final finish appearance.
h. Waterproofing:
   1) Traffic bearing membrane is defined as a heavy-duty traffic bearing membrane system. Traffic bearing membrane to be provided over utility and storage rooms.
   2) Sealer on all horizontal concrete surfaces, including slab-on-grade, to be 100% Silane.
   3) All joints to be sealed with a urethane sealant.
   4) Expansion joints to be traffic bearing, ADA compliant winged joints with elastomeric headers.

2.3 Elevators

The parking structure contains one elevator within its footprint at the northwest corner, the use of which is shared with A/B Building residents. Primary elevator features to be incorporated into the design include:

A. Simplex elevator in an appropriately sized hoistway with seven stops: One each at parking structure Levels 1 through 6, plus a rear opening at alley grade level, which is nominally 6-feet below Parking Level 1 due to vehicular ramping.

B. Size: 3,500-pounds with offset doors to allow code prescribed stretcher use.

C. Speed Rating: 350 feet per second.

D. Type: Machine Room Less (MRL) is the schematic basis of design.

E. Hoistway, pit depth, and overrun dimensions will be provided appropriate for competitive bidding.

F. Due to the building height, the elevator is required to be on emergency power. For this structure, without a gas-fired emergency generator being allowed, the emergency power will be a battery backup system allowing 90-minutes of operation (approximately 30 to 40 cycles).

G. Interior Finishes: Stainless steel walls and ceiling, walk-off tile floor.

H. Provisions for security cameras in the elevator cabs.

I. Refer to Section 2.6.4 for hoistway and control room HVAC requirements.

2.4 Fire Protection

A. The ramp will be fitted with a fire protection system designed in accordance with the Michigan Building Code and NFPA 13 and 14. The parking structure is anticipated to be classified as “open” and will be protected with manual dry standpipes spaced as required by the building code. Class 1 hose stations will be provided throughout the ramp; 150 foot radius is required for open structures.

B. A fire department (Siamese) connection will be provided within a code proscribed maximum distance to a fire hydrant on site. Because the parking structure itself does not have any street frontage, coordination with Civil and the Fire Marshall will be required to determine the final location(s) of fire department connections.

C. Fire extinguishers are required by code at 75-foot maximum spacing. Although a code requirement, some jurisdictions allow eliminating this requirement for parking structures because personnel trained to use fire extinguishers are not present on-site. We recommend requesting relief on this requirement to avoid cost and potential vandalism.

2.5 Plumbing

Plumbing systems will be provided in accordance with the 2015 Michigan Plumbing Code. Systems will include sanitary waste and ventilation, stormwater, and domestic water.

2.5.1 Sanitary

A. A new sanitary system will be tied into the City’s main sanitary drainage system in the alley.

B. The covered levels will drain to sanitary and will pass through a sand/oil separator before exiting the building.

C. The fixtures from the plumbing system associated with the office space, restroom, and janitor’s closet will be separated from the parking structure’s sanitary system.

D. A sump pump is planned for sanitary drainage from the elevator pit.

2.5.2 Storm

A. A new storm system will be tied into the City’s storm drainage system in the alley.

B. Roof drains from all three buildings will drain via gravity through a treatment unit and into an underground stormwater infiltration system under the parking lot.

C. Refer to Section 5.0 Site (Civil, Utilities, and Landscape) for more information related to the stormwater system design.

2.5.3 Domestic Water

A. A new domestic water feed will be provided from the City’s water system in State Street. Because there is no public water in the alley, the water service for the parking structure will be routed through the State Street Liner Building and into the parking structure.

B. Domestic water will be routed to the office space, janitor’s closet, and restroom.

C. A separate branch of the domestic water system will be routed to hose bibs at each level of the parking structure for washdown purposes. A domestic booster pump will be provided to ensure sufficient pressure and volume of water is available at upper levels of the parking structure. The washdown branch of the domestic water system is intended to be drained down at the end of the season. The size of the hose connections for washdown will be coordinated with the City.

2.5.4 Natural Gas

Natural gas service will not be provided.

2.5.5 Piping Systems

A. Sanitary (below grade):
   1. PVC DWV Schedule 40 piping extended from all fixtures to 5 feet outside building for connection to the site system.

B. Sanitary and Vent Systems (above grade):
   1. PVC DWV Schedule 40.

C. Stormwater Systems (above grade):
   1. PVC Schedule 40.

2.6 Mechanical

Mechanical systems will be provided in accordance with the 2015 Michigan Mechanical Code. Systems include HVAC for the office space, stair/elevator enclosures (including elevator hoistways), IT closets, electrical rooms, and mechanical rooms.

2.6.1 Operations Spaces

Operations spaces will be provided with heating via an electric furnace and split system cooling. Bathrooms and janitor space provided with ventilation.

2.6.2 Parking Garage Ventilation

Parking garage ventilation is not anticipated. The parking structure will be classified as an open parking structure.

2.6.3 Hydronic Snowmelt System

A snowmelt system will be included for the east sidewalk, parking structure entrance, and State Street sidewalk. The parking structure roof level will also have some form of snow control, be it solar panels, electric boiler driven hydronic snowmelt of varying sizes, or manual plowing. Refer to Section 1.1.L and M for additional information and options.

2.6.4 Elevator Hoistway and Control Room HVAC

A. Elevator hoistways and control rooms shall be conditioned as necessary to maintain these spaces within temperature and humidity thresholds required by elevator manufacturer.

B. It is expected that hoistway and control room temperatures must be maintained between 55°F and 90°F, with relative humidity below 95% and non-condensing.

C. Hoistways will be conditioned with packaged, wall-mounted HVAC units (DX cooling and electric heat). The units will operate via local control with no tie-in to BMS.

D. Elevator control rooms will be served by split system cooling units and electric unit heaters. The units will operate via local control with no tie-in to BMS.

2.6.5 IT Closet HVAC

A. IT Closets will be served by split system cooling units and electric unit heaters to maintain space conditions between 55°F and 80°F (or as otherwise dictated by IT equipment installed within the space).

B. HVAC equipment will operate via local control with no tie-in to BMS.

2.6.6 Electrical Room HVAC

A. Electrical rooms will be served by an exhaust fan to provide ventilation to the space when temperatures rise above setpoint.

B. Electrical rooms will be served by an electric unit heater to maintain space conditions above 55°F (or as otherwise dictated by electrical equipment installed within the space).

C. HVAC equipment will operate via local control with no tie-in to BMS.

2.6.7 Water Room HVAC

A. The Water Room will be served by an electric unit heater to maintain space conditions above freezing.

B. HVAC equipment will operate via local control with no tie-in to BMS.

2.6.8 System Controls

There is no existing Building Management System (BMS) in other DDA-operated parking facilities. In general, BMS systems allow for remote monitoring and control of applicable mechanical and electrical systems. There is no BMS system being proposed as part of this project, nor interface with any existing BMS system.

2.7 Electrical

2.7.1 Normal Power Electrical Service

A. The building will likely require a dedicated room on grade for the utility transformer. This is a vault and will need to have a 3-hour fire rating. See floor plan for approximate size. Room may require special requirements for equipment access. Details will need to be coordinated with the local utility company, Traverse City Light and Power. Conduit will need to extend from the utility transformer location to the utility connection point. Metering requirements will be coordinated with the utility. The utility equipment in this room will likely serve the parking ramp, the liner building commercial space, and the residential space.

B. New service size could be as large as 3000A. Service size will be evaluated further during design development Power source for the parking ramp to be either a new 480/277V, 3 phase, 4 wire utility transformer (intended to serve electric boiler driven hydronic systems) or a new 208/120V, 3 phase, 4 wire utility transformer located in the vault. The exact location is to be determined by the utility. The utility transformer will feed the main switchboard located in the main electrical room of the parking ramp. Dry-type step down transformers as required.

C. Main electrical room to be located in the parking ramp. See floor plan for approximate size. Egress doors with panic hardware on each end of the room are required. This room will house the main switchboard, dry-type step down transformers, distribution panels, branch panels, and other electrical equipment. The central battery inverter will be in a separate emergency electrical room. It is ideal that the main electrical room be located adjacent to or near the utility vault.

D. The entire electrical system shall be properly grounded to meet code.

E. The building will not include a natural gas service. For this reason, the electrical service will need to be sized to accommodate electric boilers (electric heat pump), electric unit heaters, and other equipment typically served by natural gas. New electrical loads will generally consist of equipment and devices associated with the new parking ramp. Electrical loads powered from the new main switchboard shall include, but are not limited to, the following: Parking ramp interior lighting (parking areas and interior rooms); parking ramp perimeter exterior site lighting; interior rooms and all other ancillary spaces; illuminated signage; electric vehicle charging stations; GFI type receptacles; communication system equipment and devices; unit heaters; heating and air conditioning units for elevator equipment; and elevators. The new main switchboard distribution section shall include spares and bussed spaces for future use.

F. Short Circuit Current, Coordination Study, and Arc Flash Hazard Analysis will be required for the power distribution system.

G. Electrical rooms in the parking ramp shall include the main electrical room, as well as one auxiliary electrical room on Level 4. The main electrical room will include additional electrical panels and associated items to serve the first three levels. The auxiliary electrical room on Level 4 will include electrical panels and associated items to serve Level 4 through Level 6. IT equipment shall not be installed in Electrical Rooms and electrical panels shall not be installed in IT Rooms.

2.7.2 Emergency Power for New Parking Ramp

The emergency power source for parking ramp shall be a central inverters. One inverter dedicated for emergency lighting and a dedicated inverter for each elevator. Inverters to include battery cabinets, controls and accessories as required. The EM electrical room housing the inverters will need to be a conditioned space with heating and cooling.

2.7.3 Conduit, Back Boxes, Conduit Supports

A. All power distribution system wiring shall be installed in conduit and PVC or non-metallic raceways.

B. Back boxes shall be provided for receptacles and switches.

C. Metal clad cable is not allowed.

D. Conduit routed horizontally through the parking ramp shall be a minimum 3/4" PVC (Schedule 40) with horizontal supports. Conduits shall be supported at proper intervals in accordance with NEC and to avoid conduit sagging.

E. Conduits routed vertically through the parking ramp shall be a minimum of 3/4" PVC (Schedule 40) with vertical supports.

F. Conduits shall be supported at proper intervals. Where conduits are subject to damage, conduits shall be RMC type or physically protected by other means.

G. All conduit supports and hardware shall be galvanized steel type to resist corrosion.

2.7.4 Normal Power Distribution Systems

A. Power distribution equipment and raceways to accommodate the new parking ramp power needs.

B. Distribution Voltages:
   1. 480Y/277V, three phase, 4-wire for larger equipment loads and lighting, and
   2. 208Y/120V, three phase, 4-wire for general power requirements.

C. Distribution Panels and Branch Panels:
   1. Power distribution system, including distribution panelboards, lighting panelboards, and receptacle panelboards. All panelboards shall include copper bus.
   2. Where double tub panels (generally 60 to 84 total branch circuits) are required, two side-by-side tubs shall be provided. One single tall tub type panelboard shall not be used.
   3. All electrical panels and transformers shall be located in dry spaces/electrical rooms to minimize electrical equipment being exposed to damp and wet locations. For panels located in electrical rooms, standard NEMA 1 rated enclosures will be acceptable.
   4. Junction boxes and disconnect switches located in the parking garage areas shall include stainless steel NEMA 4X rated enclosures.

2.7.5 Power Quality, Grounding and Bonding and Lightning Protection System

A. Surge protection devices for load side of main circuit breaker for the main switchboard and for emergency panels.

B. Power system grounding shall consist of the following:
   1. A separate green insulated ground conductor shall be provided for each feeder and branch circuit.
   2. All receptacles, switches, light fixtures, motor bases and frames, panelboards, and electrical equipment shall be grounded and bonded in accordance with NEC.

C. Main communications room and secondary communication rooms shall include an equipment ground bar made of solid copper, minimum size of 1/2" x 4" x 18" and connected back to the power distribution system ground.

D. Common grounding electrode conductor shall be run vertically to serve dry type transformers.

E. The need for a lightning protection system will be further evaluated during design development. It is anticipated that the A-B and State Street liner buildings will have a lightning protection system and will be coordinated with the parking structure.

2.7.6 Motor Controls

A. For HVAC and plumbing motors and pumps, provide variable frequency drives, electronically commutated motors with integral disconnect switches, combination motor starter disconnect switches, and single pole manual motor starters as required.

B. Safety Switches: Heavy duty type sheet steel enclosed safety switches.

2.7.7 Electrical Identification

A. All electrical switchgear – main switchboard, distribution panelboards, branch panelboards – shall include engraved lamacoid nameplate.

B. Each branch panelboard shall include a type-written circuit directory.

C. All motor starters, VFDs, disconnect switches, and contactors shall include engraved lamacoid nameplates to indicate equipment served.

2.7.8 Interior Lighting

A. All interior lighting shall be LED type, dimmable with a minimum color rendering index of 80 or higher, and color temperature of 4000K.

B. Interior lighting shall consist of the following:
   1. Parking ramp lighting fixtures shall be parking garage type fixtures pendant mounted near the bottom of the double tee stems. Parking ramp light fixtures will generally be equipped to include occupancy, daylight sensors, and dimming.
   2. Parking ramp light fixtures located along the perimeter of the parking ramp shall be controlled based on occupancy. These fixtures shall also be dimmed based on the amount of available daylight.
   3. Interior rows of lighting shall be controlled based on occupancy and not on the amount of available daylight.
   4. At the vehicular entry/exit location, an increased density of fixtures will be provided as transition lighting to ease the transition of users entering the relatively dim interior from a bright sunlit exterior condition. The transition light fixtures will be reverse photocell control, on during bright daytime and interior light levels similar to other interior spaces during dark nighttime.

C. Mechanical rooms, electrical rooms, storage rooms, and other rooms with exposed structure: 4’ industrial LED light fixtures shall be chain hung from the structure ceiling or linear fixtures attached to or suspended from structure above.

D. Light fixtures designated as emergency and exit signs shall be connected to the central inverter.

E. Exit signs shall include green lettering, weatherproof, vandal resistant type fixtures.

F. Interior Lighting Controls:
   1. Interior Rooms: Occupancy sensors and low voltage switches.
   2. Interior lighting control to be simple and meet energy code.

2.7.9 Exterior Lighting (Parking Ramp Building Perimeter)

A. All exterior lighting shall be LED type with minimum color rendering index of 80 or higher, and color temperature of 4000K.
   1. Exterior lighting shall consist of the following:
      a. Building-mounted fixtures above the vehicle entrances/exits and above exit doors used for normal use and emergency exit discharge.
      b. Light poles and fixtures on the exposed top level of the parking ramp.

B. Exterior lighting controls to be simple and meet energy code and owner requirements.

2.7.10 Fire Alarm System

A. Based on an open-air parking ramp and footprint size, it is assumed that the parking ramp will not include a fire protection system or HVAC ventilation system.

B. A code-compliant, addressable fire alarm system will be provided for the parking ramp. This system shall be capable of elevator recall. The designed system shall meet the requirements of NFPA 72.

C. The building may include manual pull stations with Stopper II Guards and fire alarm AV notification devices.

2.7.11 Communication Systems

A. Main communication room on Level 2 to cover Level 1 through Level 3. See floor plans for approximate room size.

B. Secondary communication room on Level 4 to cover Level 4 through Level 6. See floor plans for approximate room size.

C. Voice/Data Structured Cabling System:
   1. Voice/data structured cabling system per City requirements.
   2. Voice/data jacks/connections for electric meter, Wi-Fi access points, elevators, access controls, security cameras, emergency code blue light call stations, PARCS devices, and other items.

D. Two-way Communication System for Elevators:
   1. For the northwest and southeast elevators, provide two-way voice communication from the in-cab call station back to security contractor with staffing 24-7-365.

E. Emergency Blue Light Call Stations:
   1. On each level of the parking ramp, provide emergency blue light call stations near each stair/elevator with locations visible from inside the parking ramp. Each emergency blue light call station shall provide emergency two-way voice communication from the call station back to designated security location staffed 24-7-365.
   2. These call stations meet requirements for two-way communication systems at elevator lobbies.

F. Cell Phone Signal Booster Antenna System for Emergency and First Responders will be coordinated with the local AHJ/Fire Marshall if this is required.

G. Cell Phone Signal Booster Antenna System for Public Use is not included.

2.7.12 Security Cameras and Access Control Equipment

A. Security equipment and access control equipment shall be located in the main communication room.

B. The intent is not to exceed 300 feet in cable lengths. Should any cable length exceed 300-feet, specialized cables and/or converters are required to prevent power or data loss. These distances will be checked during design. The design intent is for PVC conduit to be surface mounted.

C. Camera quantity and locations to be coordinated with city during further design development. At a minimum, cameras are anticipated at:
   1. Entry and exit points.
   2. Stair and elevator main landings.
   3. Inside each elevator.
   4. Vehicular entry and exit lanes.

D. Card Reader Locations:
   1. Quantity and location of card readers to be coordinated with city and in coordination with access control for the adjacent buildings.

2.7.13 Parking Access and Revenue Control (PARCS) Systems

A. Refer to Section 1.1.E for the functional description of the PARCS equipment.

B. Power and communication are anticipated for in-lane equipment.

C. Power and communication are anticipated for pay-on-foot stations at grade level of both stair/elevators serving the parking structure.

2.7.14 Electric Vehicle Charging Stations

Level 2 type electric vehicle charging stations will be provided, similar to the Clipper Creek chargers present at the two other city-owned parking facilities. Currently, four dual head charging units are planned to serve eight spaces, of which seven are standard and one is an accessible space. The exact number and locations may be adjusted during further design development based on stakeholder input and coordination. Power sharing versus no power sharing to be determined. Revenue collection associated with electrical vehicle charging is not anticipated.

3.0 A/B Building Systems

3.1 Structural System

A. Cast-in-place reinforced concrete footings and foundation.

B. First Floor: 4” reinforced concrete slab-on-grade.

C. Structural Frame: Load bearing reinforced concrete masonry units, and structural steel columns/beams.

D. Upper Floors: 12” deep long span precast concrete hollow core plank with 2” concrete topping.

E. Roof: 10” deep long span precast concrete hollow core plank.

3.2 Architectural

A. Construction Type: II B, Fully Sprinkled.

B. Exterior Envelope:
   1. First Floor:
      a. Aluminum framed storefront system with 1” insulated glass and aluminum doors.
      b. Precast stone and metal composite panel accents with continuous insulation.
      c. Cold formed metal framing with continuous board insulation and weather barrier.
   2. Upper Floors:
      a. 6” cold form metal framing with continuous board insulation, weather barrier and 4” face brick.
      b. Spray polyurethane foam insulation in cold form metal framing cavity.
      c. Fiberglass windows with 1”, Low E glass.

C. Roof:
   1. Polyisocyanurate tapered insulation (minimum 3” thick) with 60 mil PVC roof membrane.
   2. All rooftop equipment to be set on 12” roof curbs.

D. Interior Finishes:
   1. First Floor: White Box
      a. Finished gypsum board (unpainted) demising walls.
      b. Sealed concrete floor.
      c. Exposed ceiling.
   2. Upper Floor Apartments
      a. Kitchen:
         1) Walls: Painted gypsum board.
         2) Floors: Luxury vinyl tile.
         3) Ceiling: Exposed unpainted precast concrete with exposed HVAC duct.
         4) Doors: Flush wood doors with painted hollow metal frames.
         5) Kitchen Cabinets: Plastic laminate faced casework with solid surface countertops.
         6) Kitchen Appliances: Refrigerator, electric range, microwave, and dishwasher.
      b. Living Room:
         1) Walls: Painted gypsum board.
         2) Floors: Luxury vinyl tile.
         3) Ceiling: Exposed unpainted precast concrete with exposed HVAC duct.
         4) Doors: Flush wood doors with painted hollow metal frames.
      c. Bedroom:
         1) Walls: Painted gypsum board.
         2) Floors: Luxury vinyl tile.
         3) Ceiling: Exposed unpainted precast concrete with exposed HVAC duct.
         4) Doors: Flush wood doors with painted hollow metal frames.
      d. Bathroom:
         1) Walls: Painted gypsum board.
         2) Floors: Luxury vinyl tile.
         3) Ceiling: Suspended gypsum board, painted.
         4) Doors: Flush wood doors with painted hollow metal frames.
         5) Vanity: Plastic laminate faced casework with cultured marble top and integral sink.

3.3 Fire Protection

A. General Design Criteria: Included in the scope of this project will be the installation of a new, complete fire suppression sprinkler system. The system will be designed and installed in accordance with NFPA 13 Standard for the Installation of Sprinkler Systems and NFPA 13R Standard for the Installation of Sprinkler Systems in Low-Rise Residential Occupancies and be water based. The NFPA Occupancy Hazard Classification for the building will be primarily Light Hazard for the purpose of establishing sprinkler discharge density and design calculations. Mechanical rooms and storage areas will be classified as Ordinary Hazard Group 1.

B. Utility Service: A new 6” fire sprinkler water service (independent of the domestic water service) will be brought into the building from municipal water mains.

C. System Design:
   1. A fire department pumper connection (FDC) will be located within the fire department acceptable distance from a fire hydrant. A method of draining fire department connection will be provided.
   2. Quick-response sprinkler heads shall be provided throughout the building. Recessed heads shall be used for all finished areas. Open areas, such as storage rooms and mechanical rooms, shall use upright heads with wire guards.

D. Aboveground piping materials shall be:
   1. 2-inches and smaller: Black Steel Schedule 40, threaded.
   2. 2-1/2-inches and larger: Black Steel Schedule 10, grooved.

3.4 Plumbing

A. General Design Criteria: The plumbing system will include the following work:
   1. Above ground and below grade sanitary waste and vent system.
   2. Above ground and below grade storm system with above ground storm overflow drain system.
   3. Potable domestic cold (CW), hot (HW), and hot water recirculation (HWR) systems.
   4. Condensate drainage for mechanical equipment.
   5. Plumbing fixtures.
   6. Plumbing equipment.

B. Utility Service:
   1. The plumbing scope of work will include the domestic water, storm water, and sanitary waste system utilities to 5’-0” from the building.
   2. The building will utilize municipal water for domestic water service. An estimated 3” service line, separately metered, will be required for domestic water.
   3. The building sanitary waste system will convey waste from all plumbing fixtures and HVAC equipment by gravity to 5’-0” outside of the building walls. An estimated 8” sanitary service line will be required for the building sanitary waste.
   4. Storm drainage shall be collected from building roof drains and routed to 5’-0” outside of the building walls. An estimated 6” storm drain line will be required. An additional roof overflow drainage system will be provided and will discharge to grade.

C. System Design:
   1. The potable water system shall supply all of the building systems, toilets, fixtures, etc. Cold water piping shall be sized at a maximum velocity of 6 feet per second. The potable hot water system shall utilize an electric storage hot water heater. Hot water piping shall be sized at a maximum velocity of 4 feet per second. All piping mains in the building will be located in the ceiling space.
   2. The storm piping system will be routed at 1/8-inch per foot slope.
   3. Sanitary waste piping will be routed at 1/4-inch per foot slope.

D. Plumbing systems shall utilize the following materials:
   1. Sanitary sewer, below grade shall be PVC ASTM D 2665 with solvent welded fittings.
   2. Sanitary sewer and vent, above grade shall be cast iron (ASTM A 888) pipe with hub-less fittings and stainless-steel couplings.
   3. Storm piping, below grade shall be PVC (ASTM D 2665) pipe and solvent welded fittings.
   4. Storm piping, above grade shall be cast iron (ASTM A 888) pipe with hub-less fittings and stainless-steel couplings.
   5. Domestic water, above grade shall be ASTM B88 Type L copper tubing with copper soldered joints.
   6. Pipe insulation, rigid fiberglass pipe insulation with factory applied paper-backed aluminum foil vapor barrier. All exposed piping shall be jacketed with PVC or aluminum.
      a. Domestic water, cold – 1/2-inch thick.
      b. Domestic water, hot – 1-inch thick.
      c. Horizontal storm water and roof drain pans, above grade – 1-inch thick.

E. Plumbing fixtures will be provided and located as indicated on the architectural drawings and as required by ADA.
   1. Water closets will be floor-mounted, flush tank type, with elongated bowl.
   2. Lavatories will be wall-mounted or mounted in vanity, vitreous china and ADA compliant with manual operated faucets. Mixing valves will be located below lavatory with all supplies and traps insulated.

F. Domestic hot water will be provided by one electric storage water heater installed in each unit and tenant space. A 40-gallon water heater is the estimated required size.

G. The elevator pit shall include a sump and ejector.

3.5 Mechanical

A. General Design Criteria: The heating system design will be based on a winter outdoor air, dry bulb temperature of -2°F, in accordance with ASHRAE 99.6% design conditions for Traverse City, Michigan. The system will be designed with enough capacity to provide an indoor heating season temperature of 72°F.

B. The cooling system design will be based on a summer outdoor air temperature of 89°F DB and 72°F WB, in accordance with the ASHRAE 0.4% design conditions for Traverse City, Michigan. The cooling system is designed with enough capacity to maintain a cooling season set point of 74°F.

C. Ventilation, pressurization, and air change rates will be provided in accordance with ANSI/ASHRAE Standard 62.1 and 62.2.

D. Utility Service:
   1. No natural gas will be provided to the building.

E. System Design:
   1. Unit Overview:
      a. The HVAC system shall utilize variable speed, indoor multi-position air handling units (AHU) to provide heating, cooling, and air filtration to each unit. Each AHU will be paired with a split air-source heat pump installed on the roof. Refrigerant line sets will be installed from each heat pump to the matching AHU. Each unit AHU/heat pump system will have an estimated capacity of 1-ton and furnished with an electric heating coil rated for 2.3 kW of heating capacity as back-up heat.
      b. The AHU will be installed on a field fabricated return air plenum and a low return-air grille will be installed on the exterior of the mechanical closet for unit return air. Transfer grilles will be installed in each bedroom. Supply air in each unit will be exposed, spiral duct.

c. Each unit bathroom will be equipped with an Energy Star dual-speed bath fan capable of continuous low speed operation and high-speed operation when the room is occupied.
d. The kitchen exhaust hood will be a recirculating-type.

2. Common Areas Overview:
   a. The common areas of the building will be equipped with ductless split-system heat pumps. The exterior heat pumps will be installed on the roof. Each corridor will have two units installed and one unit will be installed in the laundry room. Each ductless system will be rated for 0.75 tons.
   b. Each stairwell and the trash recycling room will be equipped with electric cabinet unit heaters. The trash room will be equipped with an independent exhaust fan system.
   c. Each dryer installed in the laundry room will be equipped with 4” round dryer exhaust duct, installed to the building exterior in accordance with the dryer manufacturer's instructions.
3. Snow Melt Overview:
   a. Exterior snow melt will be installed at the Pine Street sidewalk, along the A/B Building. An estimated 6’-0” wide area of snow melt will be provided for a total of approximately 300 square feet. The snow melt equipment infrastructure will include an electric hot water heater boiler, pumps, glycol feeder, air separator, expansion tank, and controls. All equipment will be installed in the Boiler/FP room on the First Floor.
4. Hot Water Heating Plant for Snowmelt System:
   a. The hot water heating system will be designed with low supply water temperature (120°F). The boiler plant will be designed around a single, 15kW electric hot water boiler. The system will include inline circulation pumps to distribute the hot water to the sidewalk.
      1) Hot water piping shall be Type L copper tubing.
      2) Hot water piping shall be insulated with 1-inch thick rigid fiberglass pipe insulation with factory applied paper-backed aluminum foil vapor barrier. Exposed piping shall be jacketed with PVC or aluminum.
      3) Snow melt piping shall be PEX tubing with oxygen barrier, sized at 3/4-inch.
      4) 2-inch EPS board insulation shall be installed beneath all snow melted sidewalks.
5. Ductwork:
   a. Air distribution ductwork shall be hot-dipped galvanized sheet steel with G60 coating. Ductwork shall be sealed in accordance with ASHRAE 90.1-2013 standards. Ductwork exposed in finished spaces shall be round or flat oval spiral ductwork. All concealed supply air and return air ductwork, as well as all outdoor air ductwork, shall be insulated with 1-1/2-inch thick foil-backed fiberglass insulation. Supply and return air ductwork exposed in condition spaces shall not be insulated.
   b. Low pressure ductwork (+1” w.c. pressure class) will be provided from each AHU to space diffusers and grilles.
6. Temperature Control System:
   a. All equipment controllers and space sensors shall be manufactured by the same manufacturer as the AHU/heat pumps. Controls shall be stand-alone and 7-day programmable.

3.6 Electrical

A. Power Distribution:
   1. The new main electrical service to the A/B Building will include an approximately 1600A, 120/208 Volt, 3-phase, 4-wire secondary services, with a 1600A main circuit breaker, and meter packs for the tenant, retail, and commons spaces. The service will be located on the exterior of the building and will consist of 28 individual tenant meters, each with a 125A, 208V, single phase circuit breakers, one individual meter with a 400A, 208V, three phase circuit breaker for the common elements, and two individual retail meters each with a 100A, 208V, three phase circuit breakers. The tenant panels will be placed in the bedroom of each tenant space, the retail panels will be placed in the rear of each retail space, and the common (house) panels will be located on the exterior of the building, or in a mechanical/electrical room in the common spaces. The retail, tenant, and commons electrical panels shall feed localized, general loads, such as lighting, HVAC and plumbing equipment, receptacles, as well as other miscellaneous loads. There will be space in most of the panelboards for additional circuit breakers as needed in the future. All electrical equipment will be labeled using permanent laminated acrylic (or non-conductive phenolic) nameplates.
   2. The retail, tenant, and commons panels' feeders and branch circuit raceways will be attempted in every way to be concealed, running above the ceilings, under the floor, or within the walls and in conduit. All feeders and branch circuit raceways will be installed in EMT (above grade) or Schedule 40 PVC (below grade) with a minimum size of 3/4", SER Cable, MC Cable, or type NM Cable (Romex), as permitted by the National Electrical Code. MC Cable will be limited in length to no greater than 10'-0". All exposed wiring areas will be conductors installed within conduit. Metal-clad (MC) cable will be allowed for final connections to light fixtures and equipment with a maximum length of 6'-0".
   3. Receptacles will be 15A or 20A rated, tamper-resistant (TR), residential and commercial grade, with plastic or nylon cover plates. Receptacles in the tenant spaces shall be placed like a typical residential home so that no point along any wall is more than 6' from a receptacle.
   4. Retail spaces will be finished to a white-box grade with minimal receptacles.

B. Interior and Exterior Lighting:
   1. The proposed interior and exterior lighting design and lighting levels will be coordinated with the Architect and/or Interior Designer, as well as ceiling finishes, building elevations, and civil site plans. In addition, lighting levels will comply with all local codes and ordinances as required. All interior and exterior light fixtures will be LED and will be Energy Star or DLC rated. Interior light fixture types will include recessed LED 2'x2' flat panels, LED linear strip lights, LED linear strip lights with integral occupancy sensors, recessed downlights, surface mounted lights, vanity lights, disk-style lights, wall sconces, and switch-controlled receptacles for table or floor lamps in the tenant spaces. Retail spaces will be finished to a white-box grade with minimal lighting in the form of LED linear strip lights. Exterior light fixture types will include recessed downlights, and wall mounted or ceiling mounted lights.
   2. LED exit signage with integral batteries will be appropriately placed within the building. Emergency lighting will be accomplished using batteries integral with the light fixtures or a wall mounted emergency lights as required to satisfy NFPA 101 requirements.
   3. The exterior lighting and interior lighting in the common areas will be controlled using localized, individual occupancy/vacancy sensing devices, including ceiling mounted sensors, sensor switches, over-ride switches, and over-ride plus dimming switches. All commons spaces will be controlled per the most recent Michigan Energy Code (currently based on ASHRAE 90.1-2013 standard) with regards to both interior control requirements (Local Control, Manual-ON, Partial-ON, Bi-level lighting, Top and Side Daylighting, Partial Auto-OFF, Full Auto-OFF, and Scheduled-OFF) and exterior lighting control requirements (Partial Auto-OFF, Full Auto-OFF, and Daylighting). The tenant spaces will be exempt from the automatic lighting controls requirements.

C. Low-Voltage Cabling Raceway Systems:
   1. All boxes and conduit raceway sleeves will be provided by the Division 26 contractor for the low-voltage cabling and systems, which includes but is not limited to data, telephone, cable-TV, intercommunications, public address, paging, sound, audio/visual, access controls, video surveillance, and security systems. All low-voltage cabling raceway sleeves shall be concealed unless located in a mechanical/electrical room and extended from the designated outlet and/or device to an accessible ceiling space. Raceway sleeves for incoming fiber and/or communications systems will be provided underground from the exterior utility location on site to the MDF location inside the building. All conduit raceway sleeves shall be permanently labeled describing the location and purpose of each sleeve and include large sweeps, pull strings, and bushings. All cabling, equipment, and terminations for these low-voltage systems will be provided and installed by the respective low-voltage contractor(s). Plywood fire-rated backboards will also be included on the walls of the MDF spaces. The low-voltage systems will be designed by the Owner.

3.7 Fire Alarm

An addressable fire alarm system will be installed throughout each building. The main panel for this system will be located in the main electrical room and connections will be provided to the fire suppression sprinkler system, the mechanical system units, fire/smoke dampers, door hold-open devices, as well as to other initiating and notification (visual and audible/visual) devices, and all devices in the second building. Tamper and flow switches will also be wired to this system, along with an exterior audible and visible notification device.

4.0 State Street Liner Building Systems

4.1 Structural System

A. Cast-in-place reinforced concrete footings and foundation.

B. First Floor: 4” reinforced concrete slab-on-grade.

C. Structural Frame: Load bearing reinforced concrete masonry units, and structural steel columns/beams.

D. Upper Floors: 12” deep long span precast concrete hollow core plank with 2” concrete topping.

E. Roof: 10” deep long span precast concrete hollow core plank.

4.2 Architectural

A. Construction Type: II B, Fully Sprinkled.

B. Exterior Envelope:
   1. First Floor:
      a. Aluminum framed storefront system with 1-inch insulated glass and aluminum doors.
      b. Precast stone and metal composite panel accents with continuous insulation.
      c. Cold formed metal framing with continuous board insulation and weather barrier.
   2. Upper Floors:
      a. 6-inch cold form metal framing with continuous board insulation, weather barrier and 4” face brick.
      b. Spray polyurethane foam insulation in cold form metal framing cavity.
      c. Fiberglass windows with 1-inch, Low E glass.

C. Roof:
   1. Polyisocyanurate tapered insulation (minimum 3” thick) with 60 mil PVC roof membrane.
   2. All rooftop equipment to be set on 12 inch roof curbs.

D. Interior Finishes:
   1. First Floor: White Box
      a. Finished gypsum board (unpainted) demising walls.
      b. Sealed concrete floor.
      c. Exposed ceiling.
   2. Upper Floor Apartments:
      a. Kitchen:
         1) Walls: Painted gypsum board.
         2) Floors: Luxury vinyl tile.
         3) Ceiling: Exposed unpainted precast concrete with exposed HVAC duct.
         4) Doors: Flush wood doors with painted hollow metal frames.
         5) Kitchen Cabinets: Plastic laminate faced casework with solid surface countertops.
         6) Kitchen Appliances: Refrigerator, electric range, microwave, and dishwasher.
      b. Living Room:
         1) Walls: Painted gypsum board.
         2) Floors: Luxury vinyl tile.
         3) Ceiling: Exposed unpainted precast concrete with exposed HVAC duct.
         4) Doors: Flush wood doors with painted hollow metal frames.
      c. Bedroom:
         1) Walls: Painted gypsum board.
         2) Floors: Luxury vinyl tile.
         3) Ceiling: Exposed unpainted precast concrete with exposed HVAC duct.
         4) Doors: Flush wood doors with painted hollow metal frames.
      d. Bathroom:
         1) Walls: Painted gypsum board.
         2) Floors: Luxury vinyl tile.
         3) Ceiling: Suspended gypsum board, painted.
         4) Doors: Flush wood doors with painted hollow metal frames.
         5) Vanity: Plastic laminate faced casework with cultured marble top and integral sink.

4.3 Fire Protection

A. General Design Criteria: Included in the scope of this project will be the installation of a new, complete fire suppression sprinkler system. The system will be designed and installed in accordance with NFPA 13 Standard for the Installation of Sprinkler Systems and NFPA 13R Standard for the Installation of Sprinkler Systems in Low-Rise Residential Occupancies and be water based. The NFPA Occupancy Hazard Classification for the building will be primarily Light Hazard for the purpose of establishing sprinkler discharge density and design calculations. Mechanical rooms and storage areas will be classified as Ordinary Hazard Group 1.

B. Utility Service: A new 6 inch fire sprinkler water service (independent of the domestic water service) will be brought into the building from municipal water mains.

C. System Design:
   1. A fire department pumper connection (FDC) will be located within the fire department acceptable distance from a fire hydrant. A method of draining fire department connection will be provided.
   2. Quick-response sprinkler heads shall be provided throughout the building. Recessed heads shall be used for all finished areas. Open areas, such as storage rooms and mechanical rooms, shall use upright heads with wire guards.

D. Aboveground piping materials shall be:
   1. 2-inches and smaller: Black Steel Schedule 40, threaded.
   2. 2-1/2-inches and larger: Black Steel Schedule 10, grooved.

4.4 Plumbing

A. General Design Criteria: The plumbing system will include the following work:
   1. Above ground and below grade sanitary waste and vent system.
   2. Above ground and below grade storm system with above ground storm overflow drain system.
   3. Potable domestic cold (CW), hot (HW), and hot water recirculation (HWR) systems.
   4. Condensate drainage for mechanical equipment.
   5. Plumbing fixtures.
   6. Plumbing equipment.

B. Utility Service:
   1. The plumbing scope of work will include the domestic water, storm water, and sanitary waste system utilities to 5’-0” from the building.
   2. The building will utilize municipal water for domestic water service. An estimated 3 inch service line, separately metered, will be required for domestic water.
   3. The building sanitary waste system will convey waste from all plumbing fixtures and HVAC equipment by gravity to 5’-0” outside of the building walls. An estimated 8 inch sanitary service line will be required for the building sanitary waste.
   4. Storm drainage shall be collected from building roof drains and routed to 5’-0” outside of the building walls. An estimated 6 inch storm drain line will be required. An additional roof overflow drainage system will be provided and will discharge to grade.

C. System Design:
   1. The potable water system shall supply all of the building systems, toilets, fixtures, etc. Cold water piping shall be sized at a maximum velocity of 6 feet per second. The potable hot water system shall utilize an electric storage hot water heater. Hot water piping shall be sized at a maximum velocity of 4 feet per second. All piping mains in the building will be located in the ceiling space.
   2. The storm piping system will be routed at 1/8-inch per foot slope.
   3. Sanitary waste piping will be routed at 1/4-inch per foot slope.

D. Plumbing systems shall utilize the following materials:
   1. Sanitary sewer, below grade shall be PVC ASTM D 2665 with solvent welded fittings.
   2. Sanitary sewer and vent, above grade shall be cast iron (ASTM A 888) pipe with hub-less fittings and stainless-steel couplings.
   3. Storm piping, below grade shall be PVC (ASTM D 2665) pipe and solvent welded fittings.
   4. Storm piping, above grade shall be cast iron (ASTM A 888) pipe with hub-less fittings and stainless-steel couplings.
   5. Domestic water, above grade shall be ASTM B88 Type L copper tubing with copper soldered joints.
   6. Pipe insulation, rigid fiberglass pipe insulation with factory applied paper-backed aluminum foil vapor barrier. All exposed piping shall be jacketed with PVC or aluminum.
      a. Domestic water, cold – 1/2-inch thick.
      b. Domestic water, hot – 1-inch thick.
      c. Horizontal storm water and roof drain pans, above grade – 1-inch thick.

E. Plumbing fixtures will be provided and located as indicated on the architectural drawings and as required by ADA.
   1. Water closets will be floor-mounted, flush tank type, with elongated bowl.
   2. Lavatories will be wall-mounted or mounted in vanity, vitreous china, and ADA compliant with manual operated faucets. Mixing valves will be located below lavatory with all supplies and traps insulated.

F. Domestic hot water will be provided by one electric storage water heater installed in each unit and tenant space. A 40-gallon water heater is the estimated required size.

G. The elevator pit shall include a sump and ejector.

4.5 Mechanical

A. General Design Criteria: The heating system design will be based on a winter outdoor air, dry bulb temperature of -2°F, in accordance with ASHRAE 99.6% design conditions for Traverse City, Michigan. The system will be designed with enough capacity to provide an indoor heating season temperature of 72°F.

B. The cooling system design will be based on a summer outdoor air temperature of 89°F DB and 72°F WB, in accordance with the ASHRAE 0.4% design conditions for Traverse City, Michigan. The cooling system is designed with enough capacity to maintain a cooling season set point of 74°F.

C. Ventilation, pressurization, and air change rates will be provided in accordance with ANSI/ASHRAE Standard 62.1 and 62.2.

D. Utility Service:
   1. No natural gas will be provided to the building.

E. System Design:
   1. Residential Unit Overview:
      a. The HVAC system shall utilize variable speed, indoor multi-position air handling units (AHU) to provide heating, cooling, and air filtration to each unit. Each AHU will be paired with a split air-source heat pump installed on the roof. Refrigerant line sets will be installed from each heat pump to the matching AHU. Each unit AHU/heat pump system will be sized at 1-ton. As a back-up form of heat, each AHU will be furnished with an electric heating coil rated for 2.3 kW of heating capacity.
      b. The AHU will be installed on a field fabricated return air plenum and a low return-air grille will be installed on the exterior of the mechanical closet for unit return air. Transfer grilles will be installed in each bedroom. Supply air in each unit will be exposed, spiral duct.
      c. Each unit bathroom will be equipped with an Energy Star dual-speed bath fan capable of continuous low speed operation and high-speed operation when the room is occupied.
      d. The kitchen exhaust hood will be a recirculating-type.
   2. Tenant Space Overview:
      a. The tenant spaces on the first floor will be provide with a ducted AHU, similar to each residential space. The unit will remain without ductwork until a final tenant space buildout plan is known. Code required ventilation will be provided to each space based on a typical Retail usage. Fresh air will be provided from a wall louver in exterior wall of the space.
   3. Common Areas Overview:
      a. The common areas of the building will be equipped with ductless split-system heat pumps. The exterior heat pumps will be installed on the roof. Each corridor will have two units installed and one unit will be installed in the laundry room and elevator lobby area on each floor. Each ductless system will be rated for 0.75 tons.
      b. The mobility hub, locker rooms, and entry lobbies will be provided with ductless split-systems to provide heating and cooling to each of the spaces. Exhaust will be provided in the locker rooms and mobility hub area.

c. Each stairwell and the trash recycling room will be equipped with electric cabinet unit heaters. The trash room will be equipped with an independent exhaust fan system.
d. Each dryer installed in the laundry room will be equipped with 4 inch round dryer exhaust duct, installed to the building exterior in accordance with the dryer manufacturer's instructions.

4. Ductwork:
   a. Air distribution ductwork shall be hot-dipped galvanized sheet steel with G60 coating. Ductwork shall be sealed in accordance with ASHRAE 90.1-2013 standards. Ductwork exposed in finished spaces shall be round or flat oval spiral ductwork. All concealed supply air and return air ductwork, as well as all outdoor air ductwork, shall be insulated with 1-1/2 inch thick foil-backed fiberglass insulation. Supply and return air ductwork exposed in condition spaces shall not be insulated.
   b. Low pressure ductwork (+1" w.c. pressure class) will be provided from each AHU to space diffusers and grilles.
5. Temperature Control System:
   a. All equipment controllers and space sensors shall be manufactured by the same manufacturer as the AHU/heat pumps. Controls shall be stand-alone and 7-day programmable.

4.6 Electrical

A. Power Distribution:
1. The new main electrical services to the Liner Building will include two approximately 1600A, 120/208V, 3-phase, 4-wire secondary services, each with a 1600A main circuit breaker, and meter packs for the tenant, retail, and commons spaces. Service A will be located on the exterior of the building and will consist of 28 individual tenant meters, each with a 125A, 208V, single phase circuit breakers, and one CT-cabinet with an individual meter and a 600A, 208V, three phase circuit breaker for the common elements. Service B will be located on the exterior of the building and will consist of 28 individual tenant meters, each with a 125A, 208V, single phase circuit breakers, and six individual retail meters, each with a 100A, 208V, three phase circuit breakers. The tenant panels will be placed in the bedroom of each tenant space, the retail panels will be placed in the rear of each retail space, and the common (house) panels will be located on the exterior of the building, or in a mechanical/electrical room in the common spaces. The retail, tenant, and commons electrical panels shall feed localized, general loads, such as lighting, HVAC and plumbing equipment, receptacles, as well as other miscellaneous loads. There will be space in most of the panelboards for additional circuit breakers as needed in the future. All electrical equipment will be labeled using permanent laminated acrylic (or non-conductive phenolic) nameplates.
2. An elevator battery backup will be required to provide emergency power to the elevator. The battery backup will consist of one FirstLine P924 Elevator Power Back-Up system, with the following features: One 58.5kW UPS Module, UL924 OUST, with SNMP/BacNet comms; two battery cabinets to provide 90-minute back-up at UPS full load; and one elevator power support package, including PLC controller, automatic transfer switch, and small resistive load bank with fan kit.
3. The retail, tenant, and commons panels' feeders and branch circuit raceways will be attempted in every way to be concealed, running above the ceilings, under the floor, or within the walls and in conduit. All feeders and branch circuit raceways will be installed in EMT (above grade) or Schedule 40 PVC (below grade) with a minimum size of 3/4 inch, SER cable, MC cable, or Type NM cable (Romex), as permitted by the National Electrical Code. MC cable will be limited in length to no greater than 10'-0". All exposed wiring areas will be conductors installed within conduit. Metal-clad (MC) cable will be allowed for final connections to light fixtures and equipment with a maximum length of 6'-0".
4. Receptacles will be 15A or 20A rated, tamper-resistant (TR), residential and commercial grade, with plastic or nylon cover plates. Receptacles in the tenant spaces shall be placed like a typical residential home so that no point along any wall is more than 6 feet from a receptacle.
5. Retail spaces will be finished to a white-box grade with minimal receptacles.

B. Interior and Exterior Lighting:
   1. The proposed interior and exterior lighting design and lighting levels will be coordinated with the Architect and/or Interior Designer, as well as ceiling finishes, building elevations, and civil site plans. In addition, lighting levels will comply with all local codes and ordinances as required. All interior and exterior light fixtures will be LED and will be Energy Star or DLC rated. Interior light fixture types will include recessed LED 2'x2' flat panels, LED linear strip lights, LED linear strip lights with integral occupancy sensors, recessed downlights, surface mounted lights, vanity lights, disk-style lights, wall sconces, and switch-controlled receptacles for table or floor lamps in the tenant spaces. Retail spaces will be finished to a white-box grade with minimal lighting in the form of LED linear strip lights. Exterior light fixture types will include recessed downlights, and wall mounted or ceiling mounted lights.
   2. LED exit signage with integral batteries will be appropriately placed within the building. Emergency lighting will be accomplished using batteries integral with the light fixtures or wall mounted emergency lights as required to satisfy NFPA 101 requirements.
   3. The exterior lighting and interior lighting in the common areas will be controlled using localized, individual occupancy/vacancy sensing devices, including ceiling mounted sensors, sensor switches, over-ride switches, and over-ride plus dimming switches. All commons spaces will be controlled per the most recent Michigan Energy Code (currently based on ASHRAE 90.1-2013 standard) with regards to both interior control requirements (Local Control, Manual-ON, Partial-ON, Bi-level lighting, Top and Side Daylighting, Partial Auto-OFF, Full Auto-OFF, and Scheduled-OFF) and exterior lighting control requirements (Partial Auto-OFF, Full Auto-OFF, and Daylighting). The tenant spaces will be exempt from the automatic lighting controls requirements.
   4. Low-Voltage Cabling Raceway Systems:
      a. All boxes and conduit raceway sleeves will be provided by the Division 26 contractor for the low-voltage cabling and systems, which includes, but is not limited to, data, telephone, cable-TV, intercommunications, public address, paging, sound, audio/visual, access controls, video surveillance, and security systems. All low-voltage cabling raceway sleeves shall be concealed unless located in a mechanical/electrical room and extended from the designated outlet and/or device to an accessible ceiling space. Raceway sleeves for incoming fiber and/or communications systems will be provided underground from the exterior utility location on site to the MDF location inside the building. All conduit raceway sleeves shall be permanently labeled describing the location and purpose of each sleeve and include large sweeps, pull strings, and bushings. All cabling, equipment, and terminations for these low-voltage systems will be provided and installed by the respective low-voltage contractor(s). Plywood fire-rated backboards will also be included on the walls of the MDF spaces. The low-voltage systems will be designed by the Owner.

4.7 Fire Alarm Systems

An addressable fire alarm system will be installed throughout each building. The main panel for this system will be located in the main electrical room and connections will be provided to the fire suppression sprinkler system, the mechanical system units, fire/smoke dampers, door hold-open devices, as well as to other initiating and notification (visual and audible/visual) devices, and all devices in the second building. Tamper and flow switches will also be wired to this system, along with an exterior audible and visible notification device.

5.0 Site (Civil, Utilities, and Landscape)

5.1 Layout

A. The existing structures, pavement, and landscaping within the limits of disturbance will all be demolished.

B. There will be a single vehicular entrance and exit to the parking structure on the northern alley located on the north side of the northeast corner of the proposed parking structure.

C. All pavement in the alley will be removed and replaced with concrete pavement. If environmental conditions allow, permeable pavers may be utilized in lieu of concrete pavement. Input from the environmental engineer will be required during further design development.

D. A 35-foot-wide section of West State Street will be removed and replaced with a raised pedestrian crossing composed of brick pavers and concrete.

E. Additional brick pavers will be added along West State Street, parallel to the proposed liner building to match the streetscape east of the site.

F. The concrete sidewalk between the parking structure and West State Street will have a snow melt system.

G. The concrete sidewalk between the A/B building and Pine Street will have a snow melt system.

H. Pedestrian light poles and ADA tactile warning strips will be added along West State Street as needed.

I. Existing parallel parking spaces along West State Street will be restriped to align with new pedestrian crossing.

J. All parking meters will be moved in this area.

5.2 Utilities

Refer to Sections 2.5, 3.4, and 4.4 and 2.7, 3.6, and 4.6 for Plumbing and Electrical building systems, respectively.

5.2.1 Water

A. Two domestic water service leads will be installed from the 12-inch watermain in West State Street for the liner building and parking structure.

B. One fire protection service line will also be installed at this location to service the liner building fire protection system. Because the parking structure will not have sprinklers, a fire service line is not anticipated for that structure.

C. A domestic water service and fire protection line will be installed from the 12-inch watermain in Pine Street to service the A/B building.

D. One fire hydrant and two Fire Department Connections (FDC) will be constructed on/near the southeast corner of the liner building. These FDC connections will serve the liner building and the parking structure, respectively. This arrangement and any necessary signage will be coordinated with the AHJ.

E. Fire Department Connections (FDC) will be constructed on/near the northwest corner of the A/B building.

5.2.2 Sanitary

A. New sanitary sewer services will be installed from the northern alley to serve the parking structure, liner building, and A/B building. Tie-in points of new sanitary laterals will be coordinated with final locations of building plumbing.

B. Floor drains on covered levels will drain to sanitary sewer through a sand and oil separator.

5.2.3 Electrical

A. Refer to Sections 2.7, 3.6, and 4.6 for Electrical.

5.2.4 Stormwater Management

A. Stormwater management will be installed as required by the Traverse City Ground Water Protection and Stormwater Control Ordinance. The required storage volume is equivalent to the additional stormwater runoff produced by the developed conditions when compared to when the land was entirely undeveloped.

B. An underground infiltration system constructed below the parking structure will provide the required storage volume. This system will infiltrate all water from the roof drainage from all three structures.

C. A pretreatment unit (Contech Cascade Separator or equal) will be installed before the infiltration system.

D. See Appendix 3 For preliminary sizing calculations for the infiltration system.

5.2.5 Existing Soil Conditions

A. The Geotechnical Evaluation Report is included in Appendix 2. The soils on this site are generally sandy with high permeability. No groundwater is expected to be encountered during construction.

B. There is known environmental contamination of this site. The site soils are being remediated under a separate project, which will likely include excavating contaminated soils, disposal at an appropriate landfill, and replacement.

C. Further coordination with environmental will be required to ensure contaminants are not mobilized by the stormwater infiltration system and if permeable pavers may be used in the alley.

5.2.6 Landscape

A. Currently there is no landscaping shown on the drawings for this project.

B. Landscaping along West State Street could be added if desired.

6.0 Traffic Impact Study

A. Fishbeck performed a traffic impact study evaluating the effects of the new development on the nearby streets and intersections.
   1. The overall approach to the traffic study was to first model current conditions, then future conditions without the new development, then future conditions with the new development. The current conditions model allows validation of existing conditions with recent data collection and observations. The future build and no-build conditions analyzes how the new development affects the anticipated traffic.
   2. The study included the following intersections:
      a. Union Street and Front Street (pretimed traffic signal).
      b. Union Street and State Street (pretimed traffic signal).
      c. Pine Street and Front Street (atypical NB/WB stop-control).
      d. Pine Street and Alley (minor approach WB stop-control).
      e. Union Street and Alley (minor approaches EB/WB stop-control).

B. The Traffic Impact Study is included as Appendix 4. Key points are summarized below:
   1. Existing traffic volume data was provided by the City, including recent data collected for area one-way/two-way evaluations and new data collected at the alley intersections. Fishbeck developed and calibrated the model network and the City provided concurrence with the baseline data methods and assumptions.
   2. The study included scenarios for State Street in both one-way and two-way configurations.

3. Capacity analyses were conducted based on Highway Capacity Manual (HCM) methodologies using Synchro traffic analysis software. Synchro network models were also simulated using SimTraffic to evaluate network operations, including intersection queueing. Analyses were conducted to represent the typical weekday morning (7:00 to 9:00 a.m.) and evening (4:00 to 6:00 p.m.) peak periods.
4. The study found that without the proposed parking structure, no operational improvements are necessary to mitigate any unacceptable traffic conditions. However, there are several locations that the City should continue to monitor regardless of the proposed project:
    a. Union Street (both one way and two-way conditions):
        1) Evaluate leading protected/permitted left turn phasing to clear left turn queues and allow thru traffic to progress at all studied intersections on Union Street. Introducing left turn phasing may interrupt signal coordination which is beyond the scope of this study network and such implications should be evaluated on a broader scale.
    b. Union Street and State Street (two-way conditions):
        1) The EB approach currently operates with a shared left/thru/right lane. Left turning vehicles can cause significant backups while waiting for a gap in oncoming traffic to complete their movement. If these queueing issues become excessive, an EB left turn lane should be constructed.
    c. Front Street and Pine Street (two-way conditions):
        1) The WB approach currently operates with a shared left/thru lane. The intersection currently has stop control on the NB and WB approaches. WB left turning vehicles can cause significant backups while waiting for a gap in EB traffic to complete their movement. If these queueing issues become excessive, the WB approach should be reconfigured to separate left and thru traffic lanes. Alternative traffic control, such as minor stop control, all way stop control, or signalization (as warranted), should also be considered.
5. With the addition of the parking structure traffic, the study intersections would require improvements to operate acceptably with Pine Street/State Street in either two-way or one-way operations.
    a. With the proposed project under State Street two way traffic conditions:
        1) Union Street and State Street:
            a) Construct an EB left turn lane with a minimum of 100’ of storage.
        2) Front Street and Pine Street:
            a) Reconfigure the WB approach to allow for separation of WB left turning traffic and WB thru traffic. This will require advanced signing along Front Street to inform drivers of the left hand lane drop at Pine Street.
        3) Union Street and Alley:
            a) Consider a left turn prohibition from the alley onto NB Union Street.
    b. With the proposed project under State Street one way traffic conditions:
        1) Union Street and Front Street:
            a) Protected left turn phasing on Union Street becomes critical for the NB left turn to Front Street with the proposed parking structure. Consider leading protected/permitted left turn phasing to clear left turn queue and allow thru traffic to clear the intersection.
        2) Union Street and Alley:
            a) Consider a left turn prohibition from the alley onto NB Union Street.

C. The traffic impact study did not include consideration that Front Street may be converted to two-way operations; possibly only between Union Street and Pine Street. This scenario would require further study.

D. Addressing the issues identified in the Traffic Impact Study is currently outside the scope of this project and will require coordination with City Engineering.

7.0 Estimate of Probable Construction Cost

A. For the schematic design phase, Pioneer Construction assisted the design team with preparing a program estimate of probable cost, which is included as Appendix 5.

B. There are additional project costs beyond those include in the Program Cost Estimate, which are tabulated below.

Table 1 – Total Project Estimate of Probable Design and Construction Cost

Item	Cost
State Street Liner Building	
Construction Cost	$ 20,694,110
Mobility Hub Fit Out	$ 536,037
Shell Space	$ 424,518
Construction Cost Subtotal	$ 21,654,665
A/E Design Fees (Concept and Schematic Design Completed)	$ 120,392
A/E Design Fees (Design Development through Construction)	$ 417,144
5% Escalation (Design & Construction) *	$ 1,103,590
Preconstruction CM Fees	$ 56,843
Inspections & Material Testing	$ 90,000
State Street Liner Building Total	$ 23,442,635
A-B Building	
Construction Cost	$ 9,086,554
A/E Design Fees (Concept and Schematic Design Completed)	$ 68,411
A/E Design Fees (Design Development through Construction)	$ 198,177
5% Escalation (Design & Construction) *	$ 464,237
Preconstruction CM Fees	$ 23,852
Inspections & Material Testing	$ 60,000
A-B Building Total	$ 9,901,231
Parking Structure	
Construction Cost	$ 29,521,258
A/E Design Fees (Concept and Schematic Design Completed)	$ 194,767
A/E Design Fees (Design Development through Construction)	$ 955,820
Parksmart Certification (Optional Service)	$ 20,000
5% Escalation (Design & Construction) *	$ 1,524,854
Preconstruction CM Fees	$ 77,493
Inspections & Material Testing	$ 110,000
Parking Structure Total	$ 32,404,192
Site Prep/Utilities (Water, Sanitary, and Stormwater Detention for New Buildings)	
Construction Cost	$ 798,705
A/E Design Fees (N/A, included in building costs above)	$ 0
5% Escalation (Design & Construction) *	$ 39,935
Preconstruction CM Fees	$ 2,097
Inspections & Material Testing	$ 15,000
Site Prep/Utilities Total	$ 855,737

Table 1 – Total Project Estimate of Probable Design and Construction Cost

Item	Cost
Public Space Site Work / Hardscape (Sidewalks, Alley Pavement, State Street Ped Crossing)	
Construction Cost	$ 976,478
A/E Design Fees (N/A, included in building costs above)	$ 0
5% Escalation (Design & Construction) *	$ 48,824
Preconstruction CM Fees	$ 2,563
Inspections & Material Testing	$ 15,000
Misc. Survey, Title work & Easements coordination, ALTA	$ 15,000
Public Space Site Work / Hardscape Total	$ 1,057,865
Overhead Alley Utilities Relocation to Underground	TO BE DETERMINED
Project Total **	$ 67,661,660
Notes:	
** Escalation assumes construction in 2026.*	
*** Includes contingency for design/bidding and construction, does not include Owner contingency beyond that.*	
Cost of environmental remediation, including cost of temporary earth retentions systems, is not included.	

8.0 Building Code Summary

8.1 Parking Structure Code Analysis

A. Building is a single occupancy structure: S-2 Open Parking Structure.

B. Number of Floors: Six (one at-grade and five supported levels).

C. Approximate Length and Width: 123’ x 252’.

D. Area of Occupancy Group S-2:

Level 1	31,000 sf
Level 2	31,000 sf
Level 3	31,000 sf
Level 4	31,000 sf
Level 5	31,000 sf
Level 6	26,100 sf
Total Area	181,100 sf

E. S2 Occupancy Fire Protection System: Standpipes.

Table 2 – Parking Structure Code Analysis

Building Code Requirements	Building Code Reference MBC 2015
Occupancy Classification: Public Parking Garage, Group S-2	MBC 406.4 and 311.3
Garage Interior Clear Height: 7'-0" min, 8'-2" for accessible van spaces	MBC 406.4.1 and ANSI A117.1 502.6
Guards shall be located along open-sided walking surfaces that are located more than 30 inches, measured vertically to the floor or grade below	MBC 406.4.2 and 1015.2
Vehicle barriers not less than 2'-9" in height shall be placed where the vertical distance from the floor of a drive lane or parking space to the ground or surface directly below is greater than 1'-0".	MBC 406.4.3
Vehicle ramps used for parking shall not exceed slope of 1:15. Ramps not considered as required exits.	MBC 406.4.4
Floor surface shall be of concrete or similar noncombustible and nonabsorbent materials.	MBC 406.4.5
Garage is considered an 'Open Parking Garage' with the following restrictions: • Structure shall have uniformly distributed openings on two or more sides. • 20% of exterior wall area must be open and distributed over 40% of garage perimeter per tier. Openness will be confirmed in coordination with façade treatments. • Enclosure of vertical openings (stair, ramps, etc.) not required. • Ventilation other than percentage of openings is not required.	MBC 406.5.2 MBC 406.5.9 MBC 406.5.10
Type 1B Construction • Group S-2 Occupancy and Non-sprinklered Allowable Height – Table 504.3: • Allowable building height above grade plane = 160'-0" Allowable Number of Stories – For open parking garages use Table 406.5.4 in lieu of Table 504.4 • Allowable Number of Tiers = 12 Tiers Allowable Area – For open parking garages use Table 406.5.4 in lieu of Table 506.2 • Allowable Area = Unlimited	MBC 406.5.1, 406.5.4, and 504.3
Fire Resistance Rating of Building Elements for 1B Construction: • Structural Frame: 2 hours • Interior and Exterior Bearing Walls: 2 hours • Non-Bearing Walls and Partitions: 0 hours • Floor Construction: 2 hours • Roof Construction: 1 hour	MBC Table 601
Fire Resistance Rating of Exterior Walls for S-2 Occupancy and Type 1B Construction: • Less than 10 feet: 1 hour • Greater than 10 feet: 0 hour • Greater than 30 feet: 0 hour	MBC Table 602, Noted

Table 2 – Parking Structure Code Analysis

Building Code Requirements	Building Code Reference MBC 2015
Buildings on the Same Lot: S-2 parking garage of Construction Type I erected on same lot as Group R-2 Building • Occupant use openings are permitted. • Opening protectives required only on the exterior wall of the parking garage. • 1-1/2-hour fire protection rating.	MBC 705.3, Exception 2
Allowable area of unprotected and protected openings in exterior walls based on fire separation distance with no sprinkler system: • Less than 5 feet: Not Permitted • 3 to 5 feet: Non Permitted (15% if Protected) • 5 to 10 feet: 10% (25% if Protected) • Over 10 feet: Unlimited (table Note g)	MBC Table 705.8
Automatic Sprinkler System for Buildings More Than 30'-0" in Height: • Not required for open parking structures	MBC 903.2.10
Standpipe System: • Highest floor is located less than 150 feet above the lowest level of fire department vehicle access. • Open parking garage is subject to freezing temperatures. • Open Parking Structure: Class 1 manual dry standpipes located so that all portions of building are within 30 feet of a nozzle attached to 100 feet of hose.	MBC 406.5.8 MBC 905.3.1, Exception 2 MBC 905.3.1, Exception 3 MBC 905.5
• Portable Fire Extinguishers: Size and type in accordance with NFPA 10 located so that all portions of building are within 75 feet of an extinguisher.	MBC 906.1 MBC 906.2 MBC Table 906.3
Parking Structure Design Occupant Load per Level: • Levels 1-5: 31,000 sf / 200 = 155 (EA) • Level 6: 26,100 sf / 200 = 131	MBC 1004 MBC Table 1004.1.2
Required Egress Width: • Stairway: 155 x 0.3" = 46.5" (minimum width for accessible stair is 48" clear between handrails) • Doors and other egress components: 155 x 0.2" = 31.0" (minimum width of ADA access is 32" clear)	MBC 1005 MBC 1005.3.1 MBC 1005.3.2
Number and Configuration of Exits • Minimum of two exits required placed a distance apart equal to not less than one-half of the length of the maximum overall diagonal dimension of the building or area to be served measured in a straight line between them	MBC 1006.2.1 MBC 1007.1

Table 2 – Parking Structure Code Analysis

Building Code Requirements	Building Code Reference MBC 2015
Accessible Means of Egress: • Two accessible means of egress required. Note: Parking structure shares stairs and elevators with adjacent buildings. • Elevator is required as one accessible means of egress where a required accessible floor is four or more stories above or below a level of exit discharge. Note: Adjacent buildings required to be accessible on all floors. Elevator to be in compliance with the emergency operation and signaling device requirements of the Michigan Elevator Code, R 408.7001 to R 408.8695 • A 48" clear width between stair handrails is required for accessible stairways. (Refer to exceptions.)	MBC 1009.1 MBC 1009.2.1 MBC 1009.3
Common path of egress travel shall not exceed 100 feet.	MBC Table 1006.2.1, Noted
Exit access travel distance in parking structure as measured from most remote point along natural unobstructed path to exit entrance without sprinkler system is 300 feet.	MBC 1017 MBC Table 1017.2

Appendix 1

Schematic Design Drawings

City of Traverse City

West End Mixed-Use Development

Traverse City, Michigan

100% SCHEMATIC DESIGN 03/20/2024

Project Number: 231082

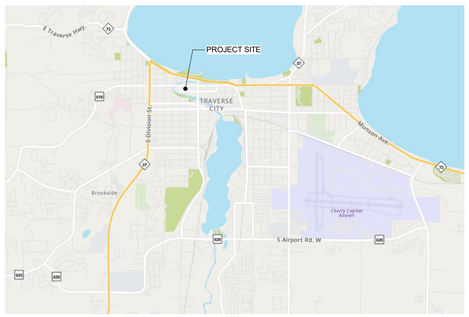
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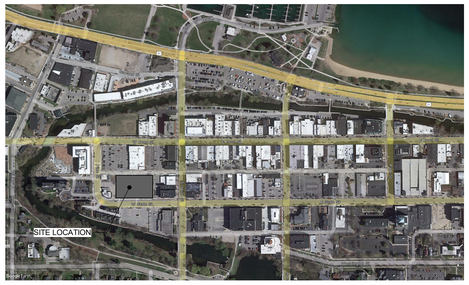
1515 Arboretum Drive,
Grand Rapids, Michigan



PROJECT LOCATION



SITE LOCATION



SHEET INDEX

GENERAL

G001	COVER

CIVIL

C101	EXISTING CONDITIONS PLAN
C102	DEMOLITION PLAN
C201	SITE LAYOUT PLAN
C401	SITE UTILITY PLAN
C501	DETAILS

ARCHITECTURAL

AL101	LINER BLDG. FLOOR PLANS
AL102	LINER BLDG. FLOOR PLANS
AL103	LINER BLDG. ENLARGED UNIT PLANS
AL200	EXTERIOR ELEVATIONS
AL202	EXTERIOR VIEWS
AB101	A/B BLDG. FLOOR PLANS
AB102	A/B BLDG. ENLARGED UNIT PLAN
AB200	EXTERIOR ELEVATIONS
AC200	PARKING DECK ELEVATIONS

ARCHITECTURAL PARKING

AP101	LEVEL 1 PLAN
AP102	LEVEL 2 PLAN
AP103	LEVEL 3 PLAN
AP104	LEVEL 4 PLAN
AP105	LEVEL 5 PLAN
AP106	LEVEL 6 PLAN
AP911	SIGN DETAILS

STRUCTURAL

S101	LEVEL 1 PLAN
S102	LEVEL 2 PLAN
S103	LEVEL 3 PLAN
S104	LEVEL 4 PLAN
S105	LEVEL 5 PLAN
S106	LEVEL 6 PLAN
S301	ELEVATIONS
S401	BUILDING SECTIONS

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Traverse City, Michigan
West End Mixed-Use Development

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Drawn By DEB
Designer FGE
Reviewer JAR
Manager JAR

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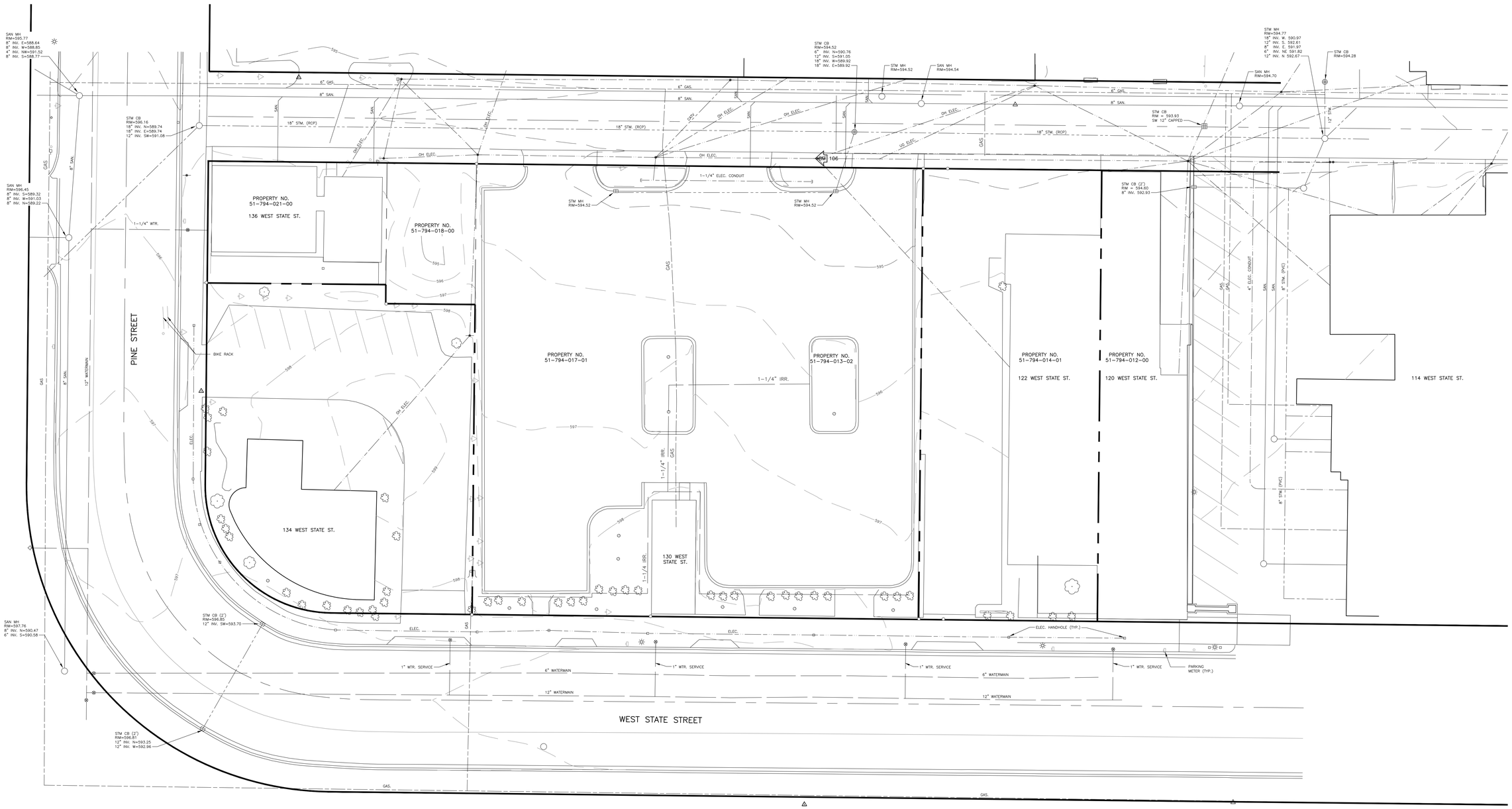
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G001

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NORTH

EXISTING CONDITIONS PLAN

SCALE: 1" = 15'

0 15 30

BENCH MARKS

BENCH MARK 106 ELEVATION: 595.30
COTTON SPINDLE IN WEST SIDE OF UTILITY POLE, 13' SOUTH OF CENTERLINE OF DRIVE ON NORTH SIDE OF SITE, 255' EAST OF CENTERLINE OF PINE STREET

SYMBOL LEGEND

- 725 EXISTING MAJOR CONTOUR
- 724 EXISTING MINOR CONTOUR
- QUARTER SECTION CORNER
- FOUND IRON
- SET IRON/PK NAIL
- SOIL BORING LOCATION
- SURVEY TRAVERSE POINT
- MANHOLE
- UTILITY POLE
- FIRE HYDRANT
- UTILITY RISER
- POST
- GUY ANCHOR
- LIGHT POLE
- BM BENCH MARK
- PROPERTY LINE
- ROAD CENTERLINE

VERTICAL DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88)
HORIZONTAL DATUM: NAD 83, MICHIGAN STATE PLANE CENTRAL ZONE, INTERNATIONAL FEET

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Traverse City, Michigan

West End Mixed-Use Development

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03/20/2024 100% SCHEMATIC DESIGN

Drawn By	MJV
Designer	ASM
Reviewer	
Manager	FGE

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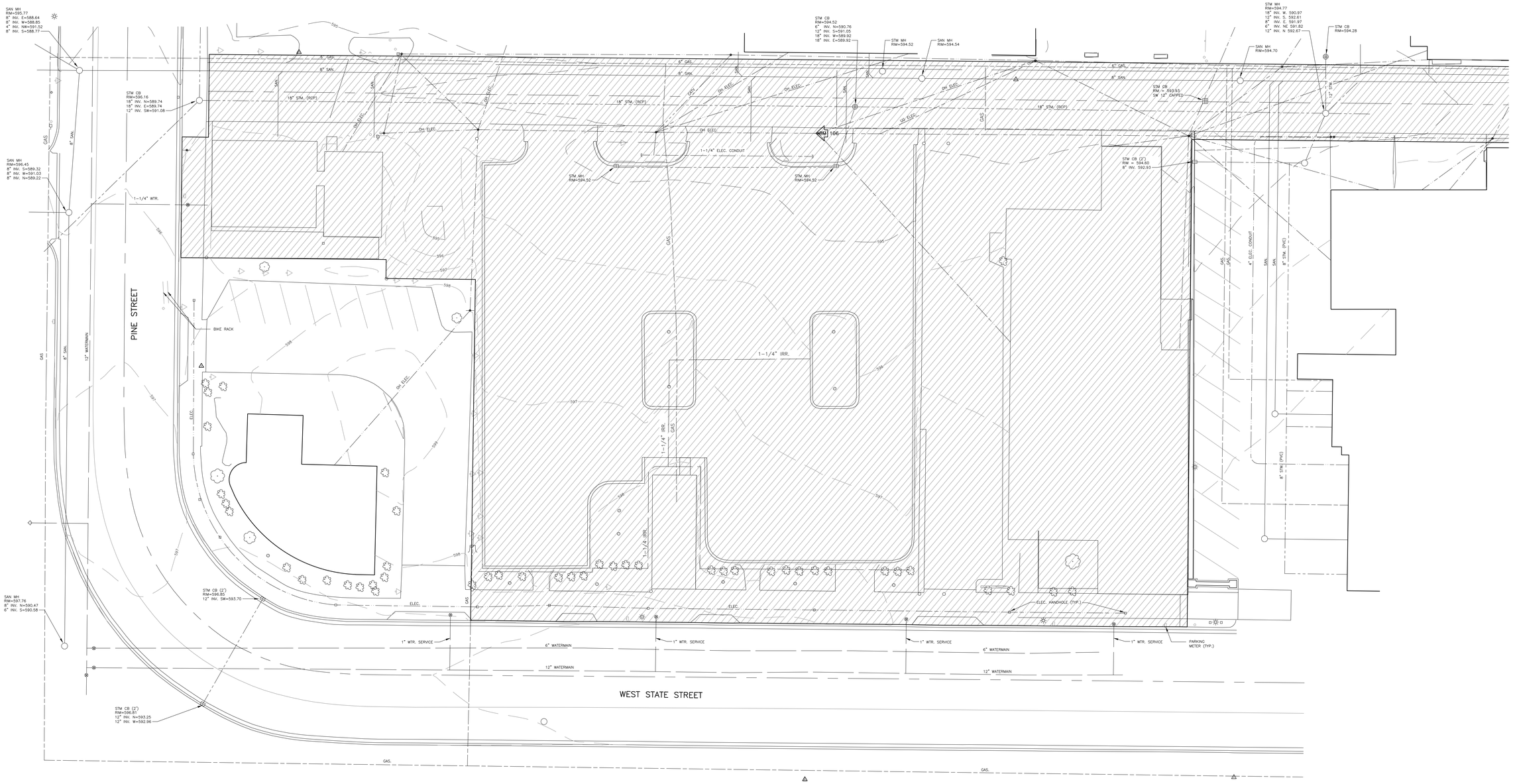
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SHEET NO.
C101

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DEMOLITION PLAN

NORTH

SCALE: 1" = 15'

0 15 30

BENCH MARKS

BENCH MARK 106 ELEVATION: 595.30
COTTON SPINDLE IN WEST SIDE OF UTILITY POLE, 13' SOUTH OF CENTERLINE OF DRIVE ON NORTH SIDE OF SITE, 255' EAST OF CENTERLINE OF PINE STREET

DEMOLITION NOTES

1. FIELD VERIFY THE EXTENT OF REMOVALS AND DEMOLITION
2. PRIOR TO CONSTRUCTION, NOTIFY ENGINEER OF ANY DEVIATIONS FROM INFORMATION SHOWN.
3. PRIOR TO CONSTRUCTION ALL FENCING, BARRICADES, ENCLOSURES, ETC., MUST BE INSTALLED AND APPROVED BY OWNER OR CONSTRUCTION MANAGER.
4. DISPOSE OF DEMOLITION AND EXCAVATION MATERIALS IN ACCORDANCE WITH CONTRACT DOCUMENTS.
5. SOIL EROSION AND SEDIMENTATION CONTROL MEASURES MUST BE IN PLACE PRIOR TO STARTING REMOVALS AND DEMOLITION.
6. UNLESS SPECIFICALLY NOTED FOR REMOVAL ON THE PLANS, PROTECT ALL SIDEWALKS, DRIVES, CULVERTS, DRAINAGE STRUCTURES, AND ABOVE AS WELL AS BELOW GRADE UTILITIES. REMOVE AND REPLACE ALL SUCH ITEMS DAMAGED OR DESTROYED DURING CONSTRUCTION WITH NEW AT NO ADDITIONAL COST TO THE OWNER.
7. PROTECT EXISTING TREES TO REMAIN WITH TEMPORARY FENCING AT THE DRIP LINE. NO GROUND DISTURBANCE OR STORAGE OF MATERIAL/EQUIPMENT SHALL OCCUR WITHIN THE DRIP LINE LIMITS.
8. COORDINATE REMOVAL OR REPLACEMENT OF ELECTRICAL, TELEPHONE, CABLE TV, WATER, FIBER OPTIC CABLE AND/OR GAS LINES WITH THE AFFECTED UTILITY COMPANY. PROVIDE ADEQUATE TIME SHALL BE PROVIDED FOR RELOCATION AND CLOSE COORDINATION WITH THE UTILITY COMPANY AS NECESSARY TO PROVIDE A SMOOTH TRANSITION IN UTILITY SERVICE. PAY CLOSE ATTENTION TO EXISTING UTILITIES WITHIN THE CONSTRUCTION LIMITS. GIVE NOTICE TO ALL UTILITY COMPANIES REGARDING DESTRUCTION AND REMOVAL OF ALL SERVICE LINES AND CAP ALL LINES BEFORE PROCEEDING WITH THE WORK.
9. PERFORM CLEARING, GRUBBING, TREE AND STUMP REMOVAL, TOPSOIL REMOVAL AND STOCKPILING IN ACCORDANCE WITH THE CONTRACT DOCUMENTS.
10. BEFORE REMOVING OR ABANDONING ANY UTILITY PIPES, VERIFY NEW UTILITY PIPE HAS BEEN INSTALLED, TESTED AND IS OPERATIONAL.
11. THE LOCATIONS OF ALL EXISTING UTILITIES SHOWN ON THIS DRAWING HAVE BEEN DETERMINED FROM THE BEST INFORMATION AVAILABLE AND ARE GIVEN FOR THE CONVENIENCE OF THE CONTRACTOR. VERIFY CRITICAL INVERT INFORMATION PRIOR TO BEGINNING CONSTRUCTION.
12. SAWCUT AND REPLACE DAMAGE CAUSED TO SURROUNDING AREA PAVEMENT OUTSIDE THE CONSTRUCTION LIMITS AT NO ADDITIONAL COST TO THE OWNER.
13. COORDINATE SEQUENCING AND PHASING OF DEMOLITION WITH CONSTRUCTION MANAGER.
14. SEE OTHER DRAWINGS FOR ADDITIONAL SITE DEMOLITION WORK.
15. SAWCUT CURB AND GUTTER AND SIDEWALKS TO NEAREST JOINT.

SYMBOL LEGEND

- 725 — EXISTING MAJOR CONTOUR
- 724 — EXISTING MINOR CONTOUR
- QUARTER SECTION CORNER
- FOUND IRON
- SET IRON/PK NAIL
- SOIL BORING LOCATION
- SURVEY TRAVERSE POINT
- MANHOLE
- UTILITY POLE
- FIRE HYDRANT
- UTILITY RISER
- POST
- GUY ANCHOR
- LIGHT POLE
- BM — BENCH MARK
- LIMITS OF DEMOLITION

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West End Mixed-Use Development

REVISIONS

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03/20/2024 100% SCHEMATIC DESIGN

Drawn By	MJV
Designer	ASM
Reviewer	
Manager	FGE

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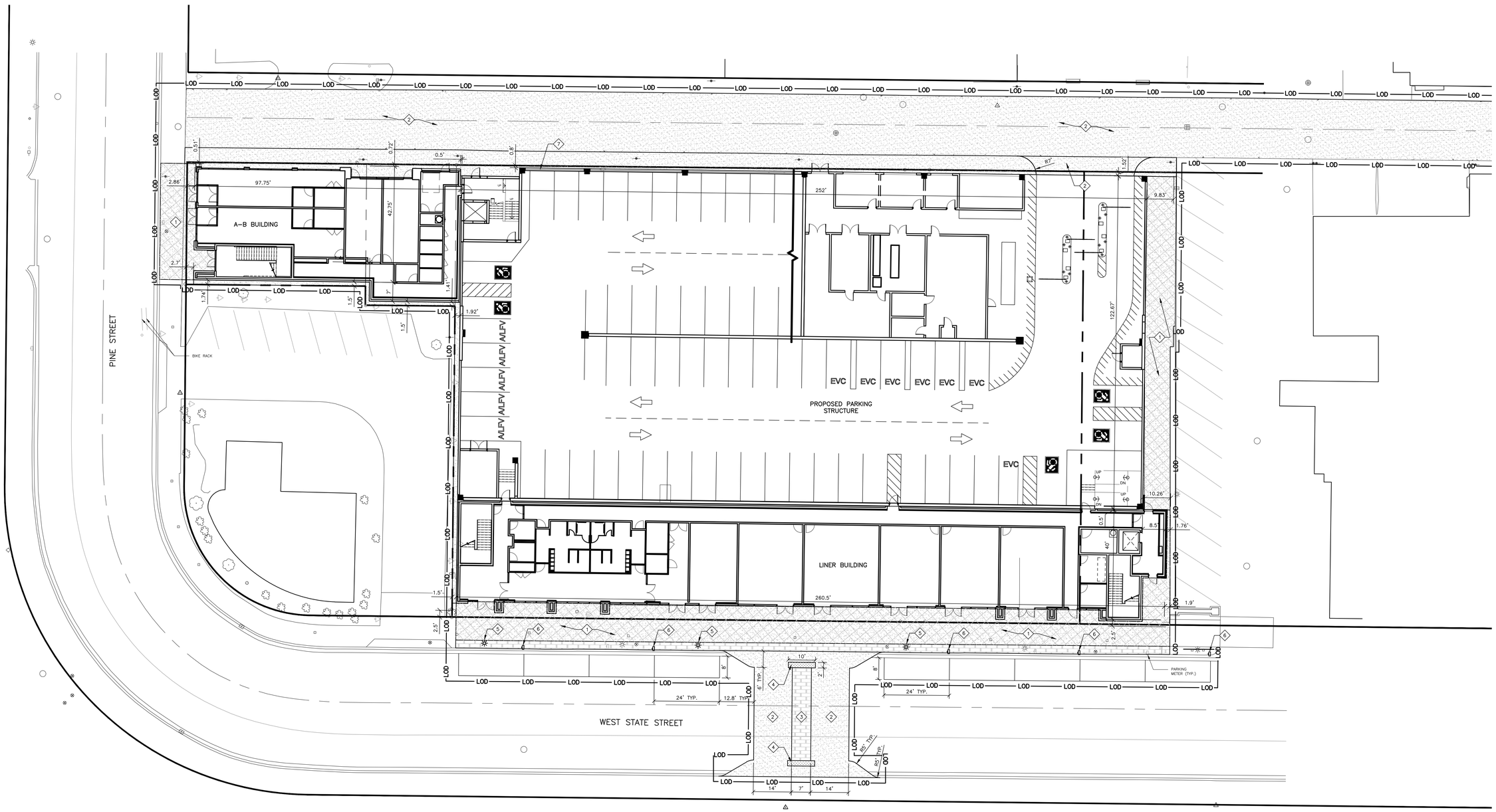
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SITE LAYOUT PLAN

SCALE: 1" = 15'

NORTH

0 15 30

KEY NOTES

1. PROPOSED 6" SNOWMELTED CONCRETE (SEE DETAIL)
2. PROPOSED 6" CONCRETE (SEE DETAIL)
3. PROPOSED BRICK PAVERS
4. ADA TACTILE WARNING STRIP
5. PROPOSED PEDESTRIAN LIGHT POLE
6. RELOCATED PARKING METER
7. PROPOSED SNOW CHUTE

NOTES

1. DIMENSIONS ARE TO BACK OF CURB, OUTSIDE FACE OF BUILDING, AND EDGE OF PAVEMENT UNLESS NOTED OTHERWISE.
2. KEEP THE APPROVED AND/OR MOST CURRENT SET OF PROJECT DRAWINGS ON SITE AT ALL TIMES. CONTRACTOR TO CONFIRM THEY ARE IN POSSESSION OF THE MOST CURRENT DRAWING FILES.

SYMBOL LEGEND

- BRICK PAVERS
- CONCRETE PAVEMENT
- CONCRETE PAVEMENT WITH SNOW MELT
- (6) PARKING SPACE COUNT
- PEDESTRIAN LIGHT POLE

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03/20/2024 100% SCHEMATIC DESIGN

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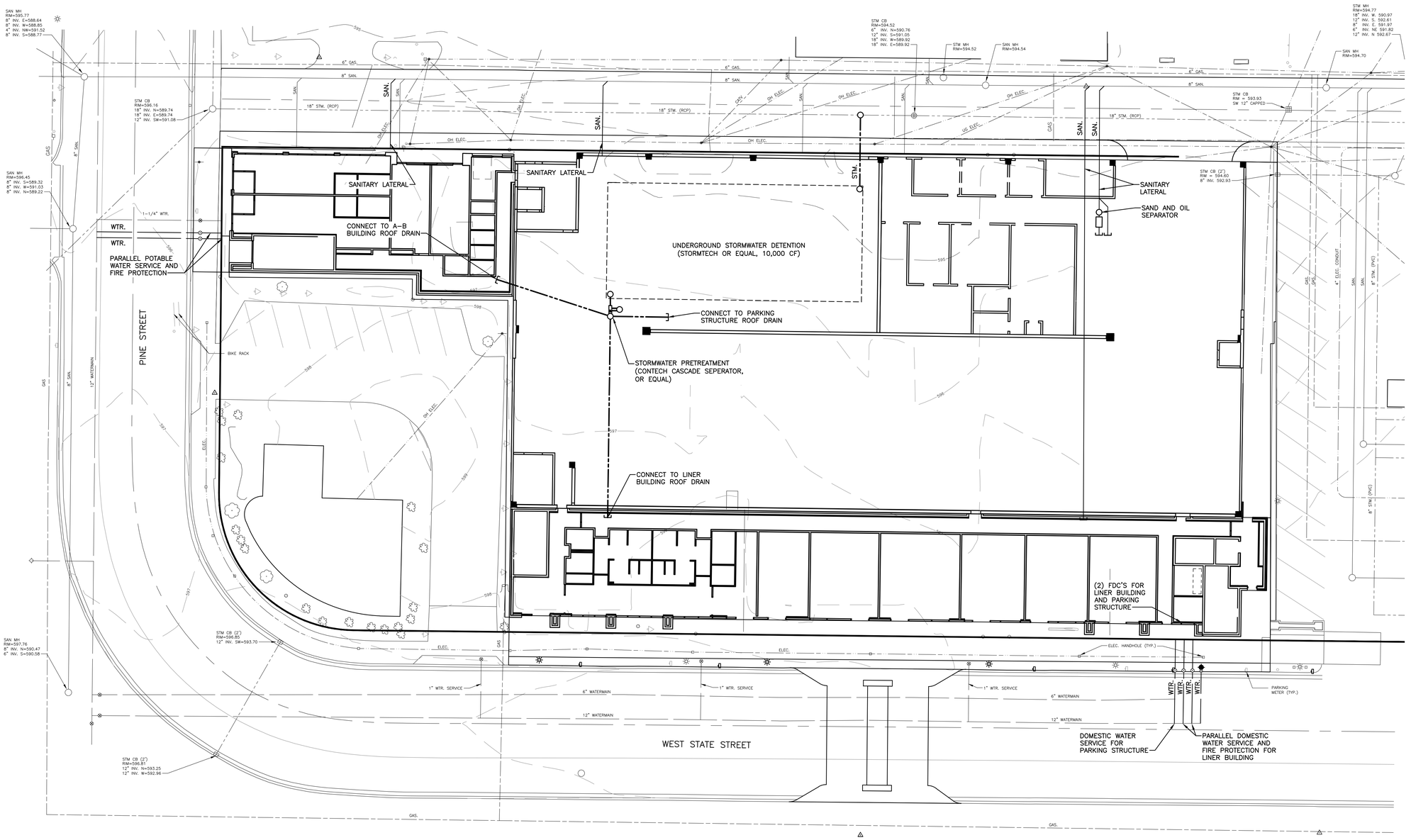
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SITE UTILITY PLAN

SCALE: 1" = 15'

BENCH MARKS

BENCH MARK 106 ELEVATION: 595.30
COTTON SPINDLE IN WEST SIDE OF UTILITY POLE,
13' SOUTH OF CENTERLINE OF DRIVE ON NORTH
SIDE OF SITE, 255' EAST OF CENTERLINE OF PINE STREET

NOTES

1. EXISTING UTILITIES LOCATIONS SHOWN ARE APPROXIMATE.
2. VERIFY THE HORIZONTAL AND VERTICAL LOCATION OF EXISTING UTILITIES PRIOR TO EXCAVATION WHERE NECESSARY.
3. PROTECT AND MAINTAIN SERVICE OF OTHER UTILITIES AT CROSSINGS.
4. DO NOT CONNECT ROOF DRAINS, FOUNDATION DRAINS, AND OTHER CLEAN WATER SERVICES TO THE SANITARY SEWER.
5. END SECTIONS ARE INCLUDED IN PIPE LENGTHS SHOWN.
6. PROVIDE AND MAINTAIN INLET FILTERS AT ALL CATCH BASIN INLETS, DURING CONSTRUCTION.
7. WATER MAIN TO HAVE A MINIMUM OF 5.5 FEET OF COVER.
8. FIRE HYDRANTS LOCATED IN CURB ISLAND OR GREEN SPACE SHALL BE LOCATED 5' FROM BACK OF CURB OR EDGE OF PAVEMENT (TYP.).
9. PROVIDE A MINIMUM OF EIGHTEEN (18) INCHES OF VERTICAL SEPARATION AND TEN (10) FEET OF HORIZONTAL SEPARATION BETWEEN THE WATER MAIN AND ALL SANITARY AND STORM SEWERS.
10. FACE NOZZLES OF SITE FIRE HYDRANTS TOWARD BUILDING.
11. ADJUST ALL CASTINGS TO FINISH GRADES.
12. PIPE LENGTHS ARE TO CENTER OF STRUCTURES UNLESS NOTED OTHERWISE. ALL PIPE LENGTHS ARE FOR THE CONVENIENCE OF THE CONTRACTOR.
13. UTILITY ELEVATIONS INDICATED REPRESENT INVERT ELEVATIONS UNLESS OTHERWISE NOTED.

SYMBOL LEGEND

- 8" SAN. — SANITARY SEWER & MANHOLE
- WYE & LEAD
- RISER & LEAD
- STANDARD SEWER CLEANOUT
- 12" STORM — STORM SEWER & MANHOLE
- CATCH BASIN
- UNDERDRAIN
- 8" WATER — WATER MAIN
- VALVE & BOX
- VALVE & CHAMBER
- M — METER
- PLUG
- STANDARD FIRE HYDRANT ASSEMBLY
- CURB STOP & BOX
- GAS MAIN
- ELECTRIC
- TELEPHONE/FIBER OPTIC

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Traverse City, Michigan

West End Mixed-Use Development

REVISIONS

NOT FOR CONSTRUCTION

03/20/2024 100% SCHEMATIC DESIGN

Drawn By	MJV
Designer	ASM
Reviewer	
Manager	FGE

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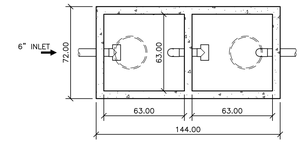
PROJECT NO.
231082

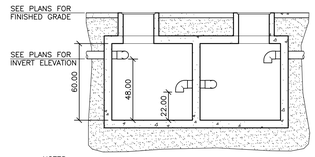
SHEET NO.
C401

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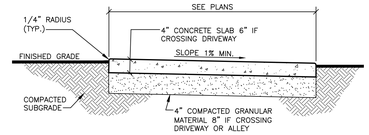
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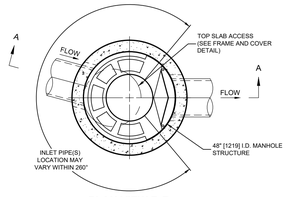


NOTES:
1. DRAWING IS FOR REFERENCE ONLY AND IS TO BE USED FOR PLUMBING REFERENCE. CONSULT WITH TANK MANUFACTURER FOR TANK LOADS.
2. SEAL ALL TANK PENETRATIONS TO PROVIDE WATER TIGHT SEAL TO PREVENT TANK LEAKAGE INTO SOIL.
3. APPROX. TANK VOLUME IS 1500 GALLONS.

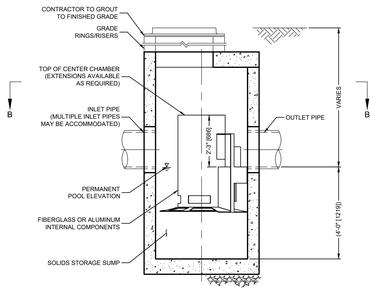
SANITARY SEWER SAND SEPARATOR
NO SCALE



SIDEWALK DETAIL
NO SCALE CP-002



PLAN VIEW B-B
NOT TO SCALE



ELEVATION A-A
NOT TO SCALE

CASCADE SEPARATOR DESIGN NOTES

THE STANDARD #### CONFIGURATION IS SHOWN. ALTERNATE CONFIGURATIONS ARE AVAILABLE AND ARE LISTED BELOW. SOME CONFIGURATIONS MAY BE COMBINED TO SUIT SITE REQUIREMENTS.

CONFIGURATION DESCRIPTION

- GRATED INLET ONLY (NO INLET PIPE)
- GRATED INLET WITH INLET PIPE OR PIPES
- CURB INLET ONLY (NO INLET PIPE)
- CURB INLET WITH INLET PIPE OR PIPES



FRAME AND COVER
(DIAMETER VARIES)
NOT TO SCALE

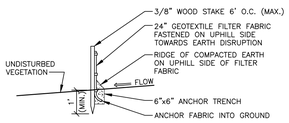
SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID			
WATER QUALITY FLOW RATE (cfs [L/s])			
PEAK FLOW RATE (cfs [L/s])			
RETURN PERIOD OF PEAK FLOW (yrs)			
RIM ELEVATION			
PIPE DATA	INVERT	MATERIAL	DIAMETER
INLET PIPE 1			
INLET PIPE 2			
OUTLET PIPE			
NOTES / SPECIAL REQUIREMENTS:			

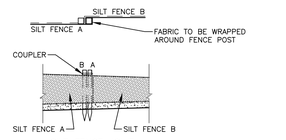
GENERAL NOTES
1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. FOR SITE SPECIFIC DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHT, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.ContechES.com
3. CASCADE SEPARATOR WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING. CONTRACTOR TO CONFIRM STRUCTURE MEETS REQUIREMENTS OF PROJECT.
4. CASCADE SEPARATOR STRUCTURE SHALL MEET AASHTO HS20 LOAD RATING, ASSUMING EARTH COVER OF 0' - 2' [610], AND GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION.
5. CASTINGS SHALL MEET AASHTO M306 AND BE CAST WITH THE CONTECH LOGO.
6. CASCADE SEPARATOR STRUCTURE SHALL BE PRECAST CONCRETE CONFORMING TO ASTM C478 AND AASHTO LOAD FACTOR DESIGN METHOD.
7. ALTERNATE UNITS ARE SHOWN IN MILLIMETERS [mm].

INSTALLATION NOTES
A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CASCADE SEPARATOR MANHOLE STRUCTURE.
C. CONTRACTOR TO INSTALL JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS AND ASSEMBLE STRUCTURE.
D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT INLET AND OUTLET PIPE(S). MATCH PIPE INVERTS WITH ELEVATIONS SHOWN. ALL PIPE CENTERLINES TO MATCH PIPE OPENING CENTERLINES.
E. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.

CONTECH
ENGINEERED SOLUTIONS LLC
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX



SECTION

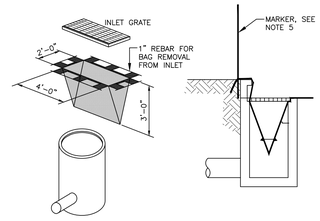


SILT FENCE JOINT

NOTES:

1. CONSTRUCT SILT FENCE BEFORE UP SLOPE GROUND COVER IS REMOVED. CLEARING, GRUBBING, AND STUMPING CAN OCCUR BEFORE SILT FENCE INSTALLATION IF GROUND COVER IS NOT REMOVED.
2. PLACE ALL SILT FENCE PARALLEL TO THE SLOPE AS POSSIBLE SO THAT WATER WILL NOT CONCENTRATE AT LOW POINTS IN THE FENCE AND SO THAT SMALL SWALES OR DEPRESSIONS THAT MAY CARRY SMALL CONCENTRATED FLOWS TO THE SILT FENCE ARE DISSIPATED ALONG ITS LENGTH.
3. INSTALL ENDS OF THE SILT FENCES UP SLOPE 12" IN ELEVATION SO THAT WATER PONDED BY THE SILT FENCE WILL BE PREVENTED FROM FLOWING AROUND THE ENDS.
4. INSTALL THE TRENCH WITH A TRENCHER, CABLE LAYING MACHINE, SLICING MACHINE, OR OTHER SUITABLE DEVICE THAT WILL ENSURE AN ADEQUATELY UNIFORM TRENCH DEPTH.
5. WHERE TWO SECTIONS OF PREFABRICATED SILT FENCE ARE COMBINED INTO ONE RUN, THE END POSTS SHALL BE CONNECTED TOGETHER, NOT SIMPLY OVERLAPPED.
6. SILT FENCE SHALL ALLOW RUNOFF TO PASS ONLY AS DIFFUSE FLOW THROUGH THE GEOTEXTILE. IF RUNOFF OVERTOPS THE SILT FENCE, FLOWS AROUND THE ENDS, OR IN ANY OTHER WAY BECOMES A CONCENTRATED FLOW, ONE OF THE FOLLOWING SHALL BE PERFORMED, AS APPROPRIATE: A) AN ADDITIONAL RUN OF SILT FENCE SHALL BE PLACED UPSTREAM, B) THE LAYOUT OF THE SILT FENCE SHALL BE CHANGED, C) ACCUMULATED SEDIMENT SHALL BE REMOVED, OR D) OTHER BEST MANAGEMENT PRACTICES SHALL BE IMPLEMENTED.
7. INSPECT FREQUENTLY AND IMMEDIATELY AFTER EACH STORM EVENT. CHECK SEVERAL TIMES DURING PROLONGED STORM EVENTS. IF NECESSARY, REPAIR IMMEDIATELY.
8. REMOVE SEDIMENT DEPOSITS WHEN THE DEPOSIT REACHES APPROXIMATELY ONE–HALF OF THE HEIGHT OF THE SILT FENCE.
9. REMOVE SILT FENCE ONLY WHEN ALL UPSTREAM VEGETATION IS FULLY ESTABLISHED AND DIRECTED BY ENGINEER/OWNER.

54 SILT FENCE DETAIL
NO SCALE SE–054



ISOMETRIC VIEW INSTALLATION DETAIL

NOTES:

1. PLACE FILTER FABRIC BAG INSIDE THE INLET BENEATH THE GRATE.
2. REPLACE GRATE, WHICH WILL HOLD BAG IN PLACE.
3. ANCHOR FILTER BAG SO IT WILL NOT DROP INTO CATCH BASIN.
4. EXTEND FLAPS OF BAG BEYOND THE BAG. BURY IN SOIL IN EARTH AREAS.
5. IF CATCH BASIN IS IN A LOW DEPRESSION – MARK CB LOCATION WITH A MARKER TO ASSIST LOCATING CATCH BASIN IF FLOODING OCCURS.
6. INSPECT DROP INLET FILTERS ROUTINELY AND AFTER EACH RAIN EVENT.
7. REPLACE DAMAGED FILTER BAGS IMMEDIATELY.
8. CLEAN AND/OR REPLACE FILTER BAG WHEN 1/2 FULL. REPLACE CLOGGED FABRIC IMMEDIATELY.
9. VACUUM OUT CATCH BASIN SUMP IF FILTER BAG TEARS.
10. REMOVE ENTIRE PROTECTIVE MECHANISM WHEN UPGRADIENT AREAS ARE STABILIZED AND STREETS HAVE BEEN SWEPT AND/OR DIRECTECTED BY ENGINEER/OWNER.

56 INLET PROTECTION – FABRIC DROP
NO SCALE SE–056

DETAILS

PLOT INFO: Z:\2023\231082\CAD\CD\C501_231082.DWG LAYOUT: C501 DATE: 3/6/2024 TIME: 4:32:09 PM USER: MVANZEELT

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Traverse City, Michigan

West End Mixed-Use Development

REVISIONS

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03/20/2024 100% SCHEMATIC DESIGN

Drawn By	MJV
Designer	ASM
Reviewer	
Manager	FGE

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PROJECT NO.
231082

SHEET NO.
C501

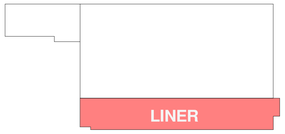
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LINER BUILDING - UNIT MIX TOTALS

PER TYP. RESIDENTIAL FLOOR:

A-UNIT [1 BED, 1 BATH].....9
B-UNIT [2 BED, 1 BATH].....2
C-UNIT [2 BED, 2 BATH].....2
D-UNIT [2 BED, 1 BATH].....1
TOTAL UNITS PER FLOOR.....**14**

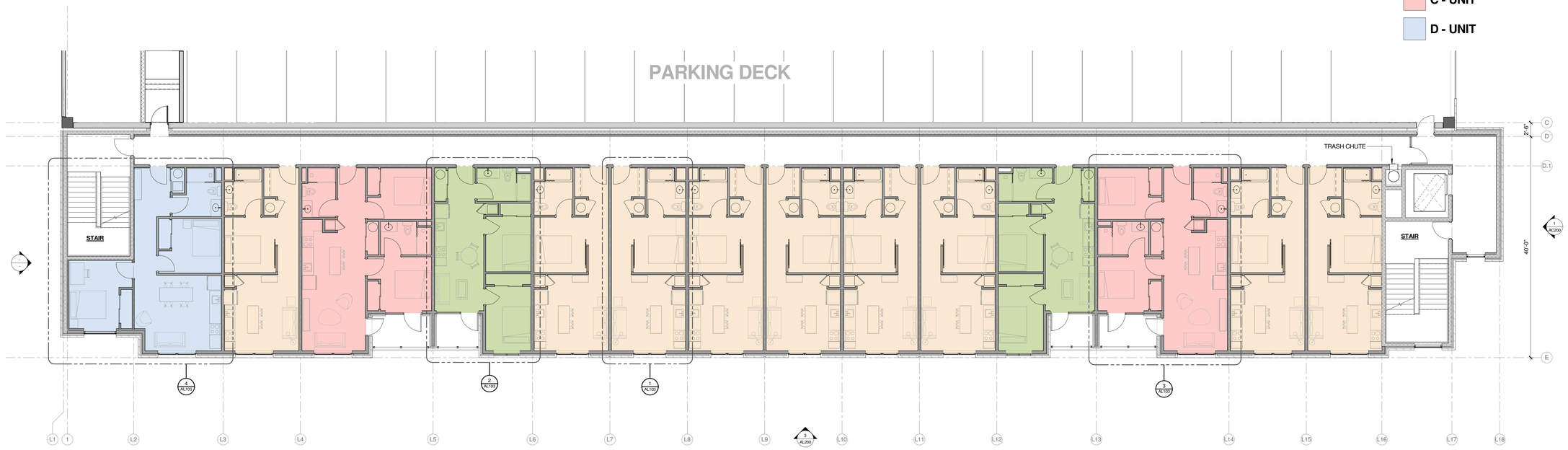
BUILDING TOTAL
14 UNITS PER FLOOR x (4) FLOORS = 56 UNITS
TOTAL UNTS AT LINER BUILDING.....**56 UNITS**



KEY PLAN

UNIT DISTRIBUTION

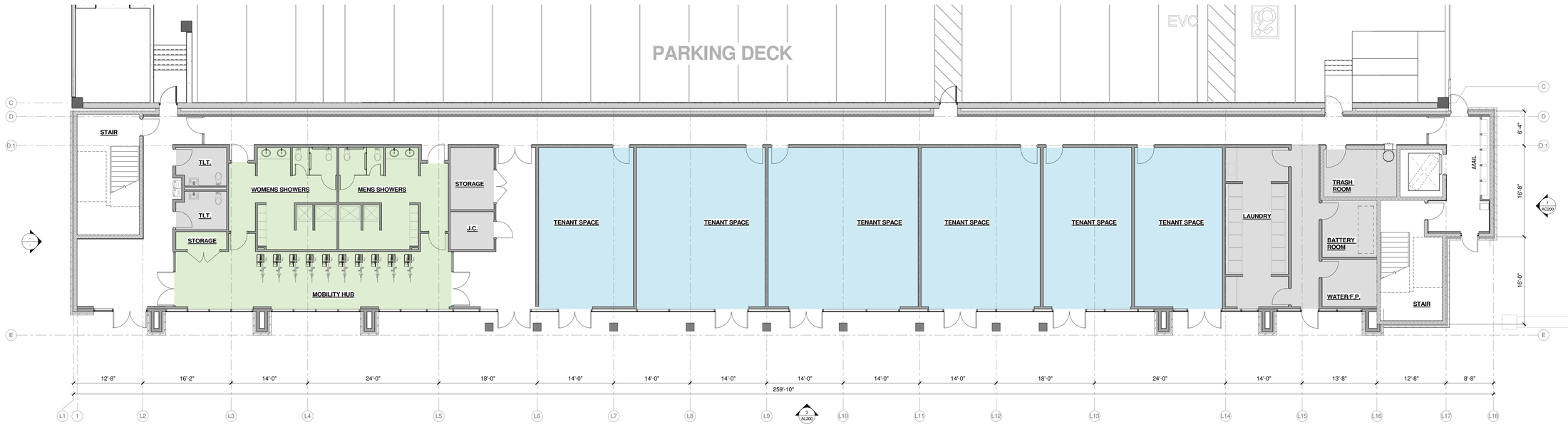
- **A - UNIT**
- **B - UNIT**
- **C - UNIT**
- **D - UNIT**



N

SECOND/THIRD/FOURTH FLOOR LINER BUILDING PLAN

SCALE: 1/8" = 1'-0"



N

FIRST FLOOR LINER BUILDING PLAN

SCALE: 1/8" = 1'-0"

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Traverse City, Michigan

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REVISIONS

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03/20/2024 100% SCHEMATIC DESIGN

Drawn By	AL
Designer	JD
Reviewer	AL
Manager	AL

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231082

SHEET NO.

AL101

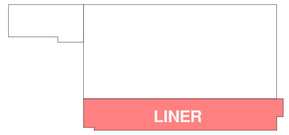
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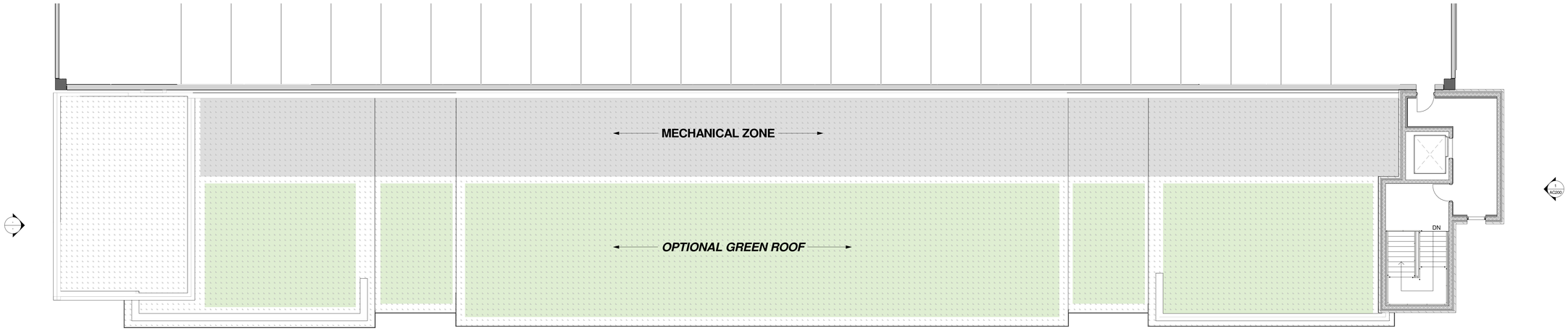
FLOOR PLAN KEYNOTE LEGEND

GENERAL FLOOR PLAN NOTES

- ALL INTERIOR DIMENSIONS ARE TO FACE OF FRAMING, U.O.N.
- ALL EXTERIOR DIMENSIONS ARE TO EXTERIOR FACE OF FOUNDATION WALL
- REFER TO WALL SECTION AND WALL TYPE LEGEND FOR WALL CONSTRUCTION
- REFER TO MECHANICAL & ELECTRICAL DRAWINGS FOR EQUIPMENT MOUNTING REQUIREMENTS

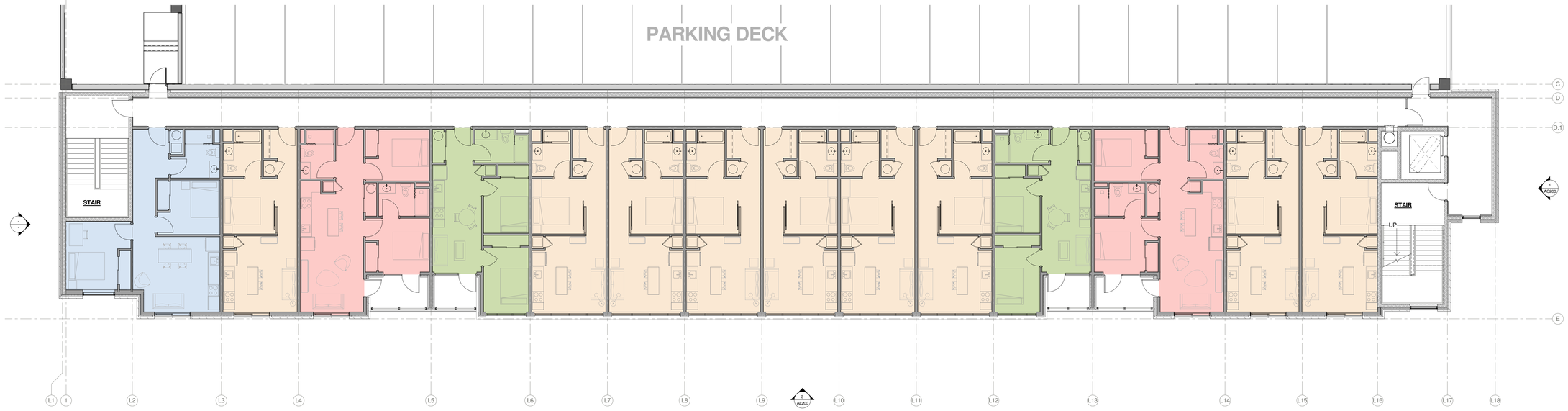


KEY PLAN



N

ROOF LEVEL
SCALE: 1/8" = 1'-0"



N

FIFTH FLOOR PLAN
SCALE: 1/8" = 1'-0"

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03/20/2024	100% SCHEMATIC DESIGN

Drawn By	AL
Designer	JD
Reviewer	AL
Manager	AL

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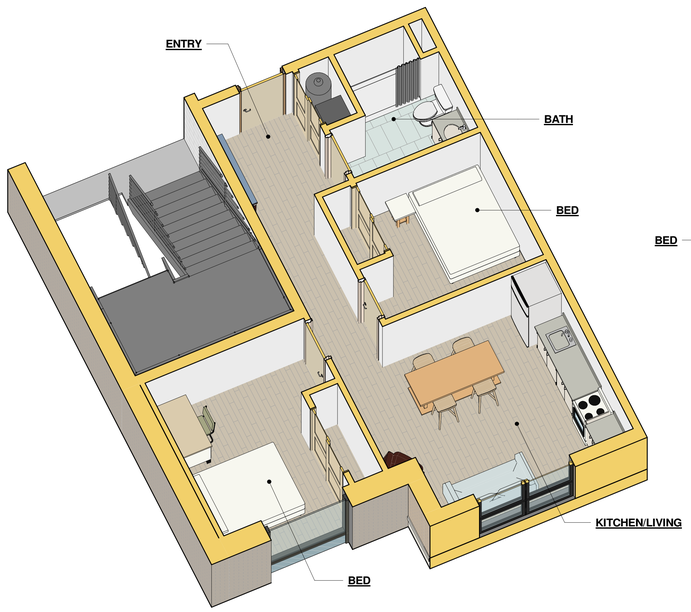
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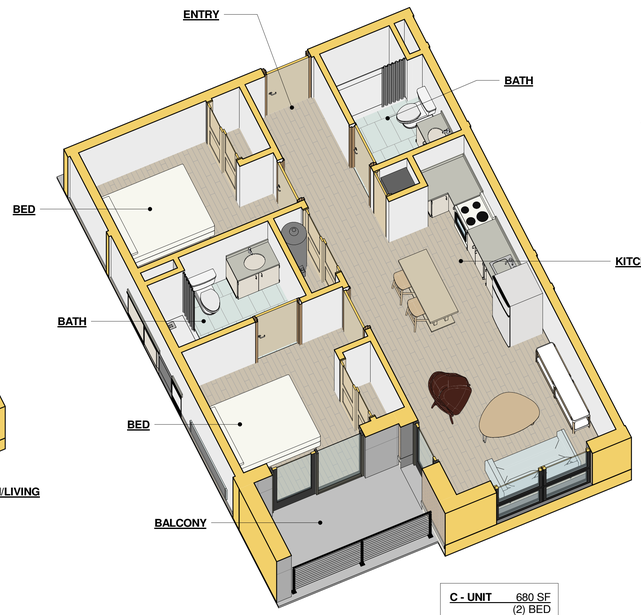
AL102

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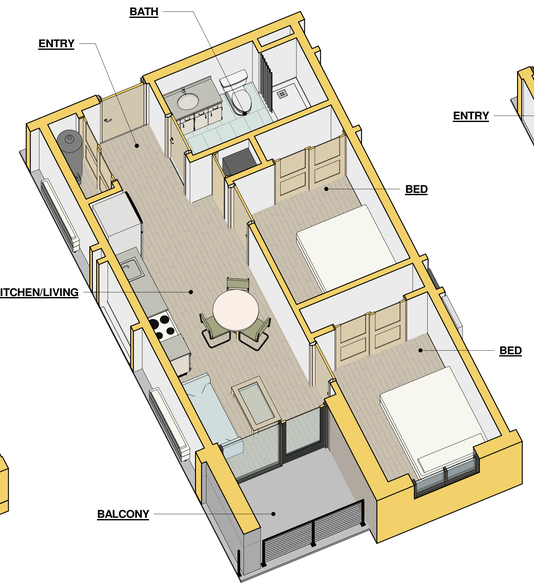
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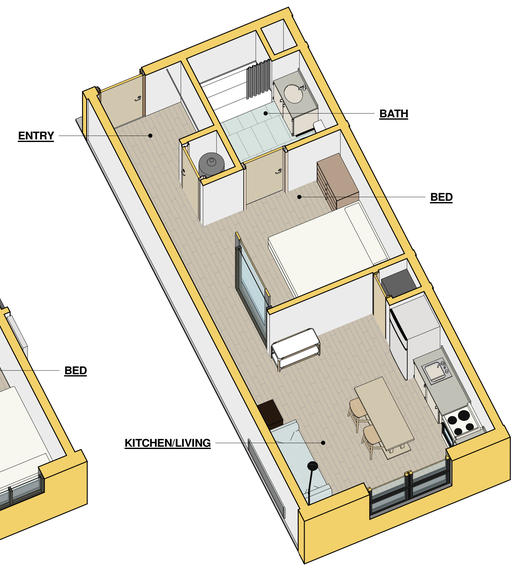
D - UNIT 625 SF
(2) BED
(1) BATH



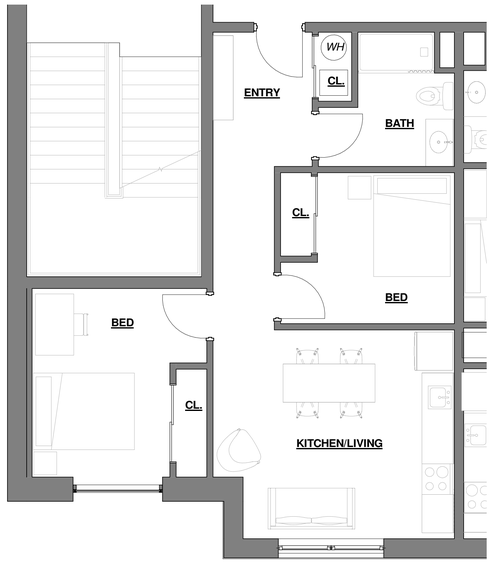
C - UNIT 680 SF
(2) BED
(2) BATH



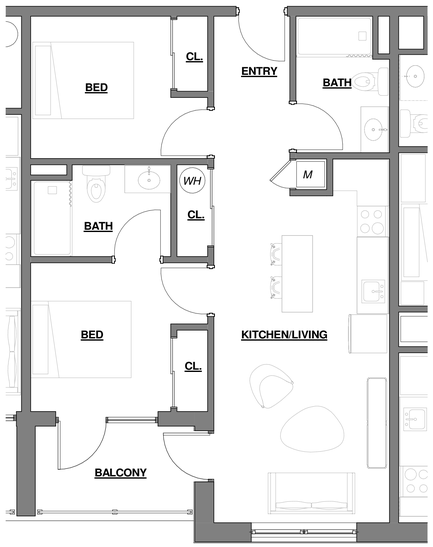
B - UNIT 500 SF
(2) BED
(1) BATH



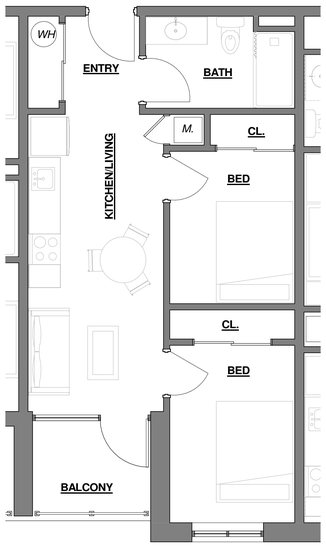
A - UNIT 430 SF
(1) BED
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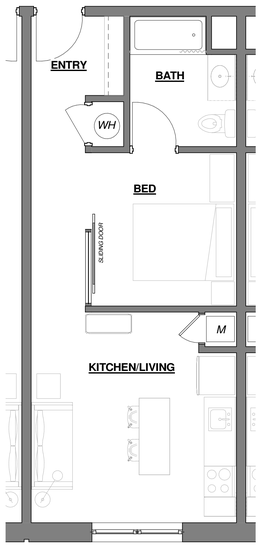
4 AL103 **(LINER) TYPICAL D-UNIT**
SCALE: 1/4" = 1'-0"



3 AL103 **(LINER) TYPICAL C-UNIT**
SCALE: 1/4" = 1'-0"



2 AL103 **(LINER) TYPICAL B-UNIT**
SCALE: 1/4" = 1'-0"



1 AL103 **(LINER) TYPICAL A-UNIT**
SCALE: 1/4" = 1'-0"

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Traverse City, Michigan

West End Mixed-Use Development

REVISIONS

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03/20/2024 100% SCHEMATIC DESIGN

Drawn By	AL
Designer	JD
Reviewer	AL
Manager	AL

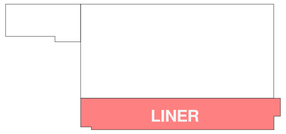
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SHEET NO.
AL103

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KEY PLAN



1 AL200 **ENLARGED SOUTH ELEVATION - WEST**
SCALE: 1/8" = 1'-0"



3 AL200 **L-SOUTH ELEVATION**
SCALE: 1/16" = 1'-0"



2 AL200 **ENLARGED SOUTH ELEVATION - EAST**
SCALE: 1/8" = 1'-0"

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Drawn By	AL
Designer	JD
Reviewer	AL
Manager	AL

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SHEET NO.
AL200

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2 AL202 **LINER BUILDING VIEW NORTH ON STATE ST.**
NOT TO SCALE



1 AL202 **LINER BUILDING VIEW SOUTH ON STATE ST.**
SCALE:

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Reviewer	AL
Manager	AL

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PROJECT NO.
231082

SHEET NO.
AL202

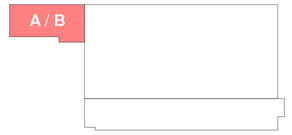
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A/B BUILDING - UNIT MIX TOTALS

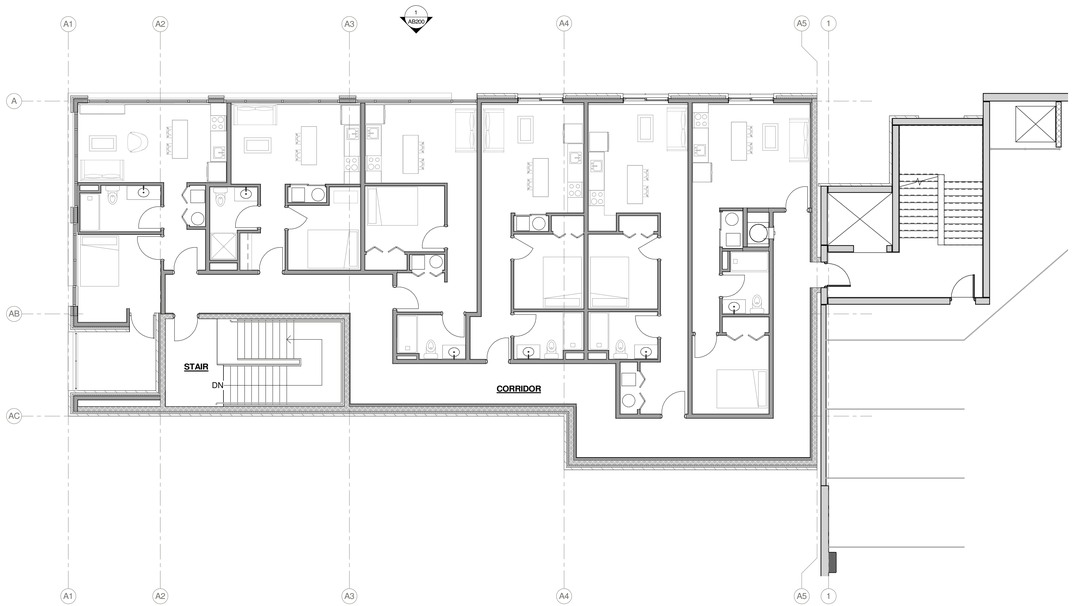
PER TYP. RESIDENTIAL FLOOR:

TOTAL [1 BED, 1 BATH] UNITS PER FLOOR.....**6**

BUILDING TOTAL
6 UNITS PER FLOOR x (4) FLOORS = 24 UNITS
ACCESSIBLE UNITS AT FIRST FLOOR.....2 UNITS
TOTAL UNITS AT A/B BUILDING.....**26 UNITS**

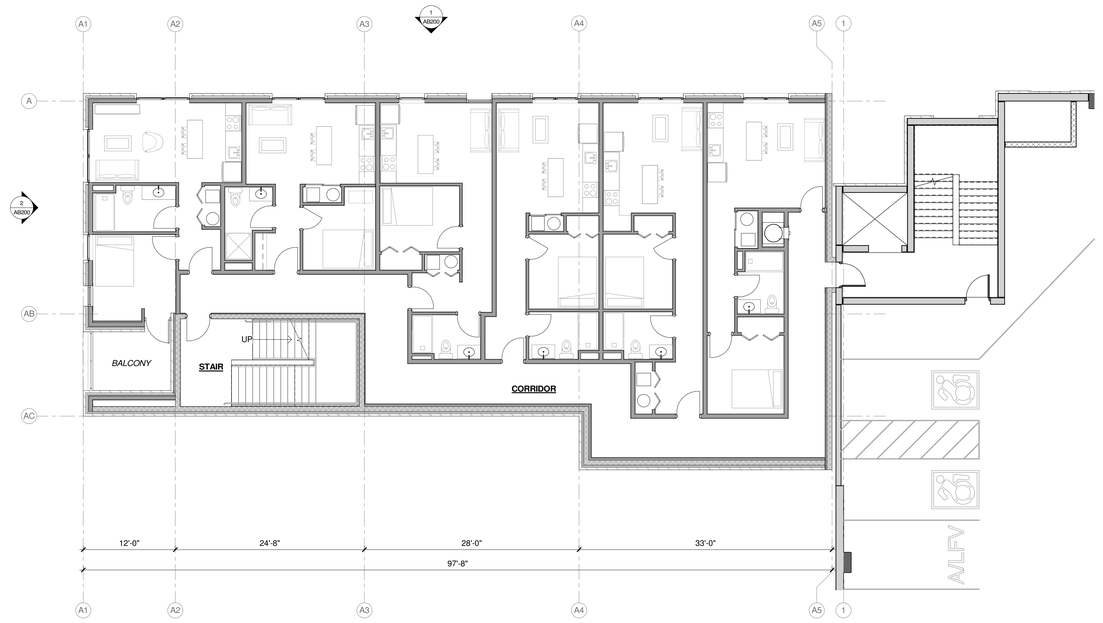


KEY PLAN



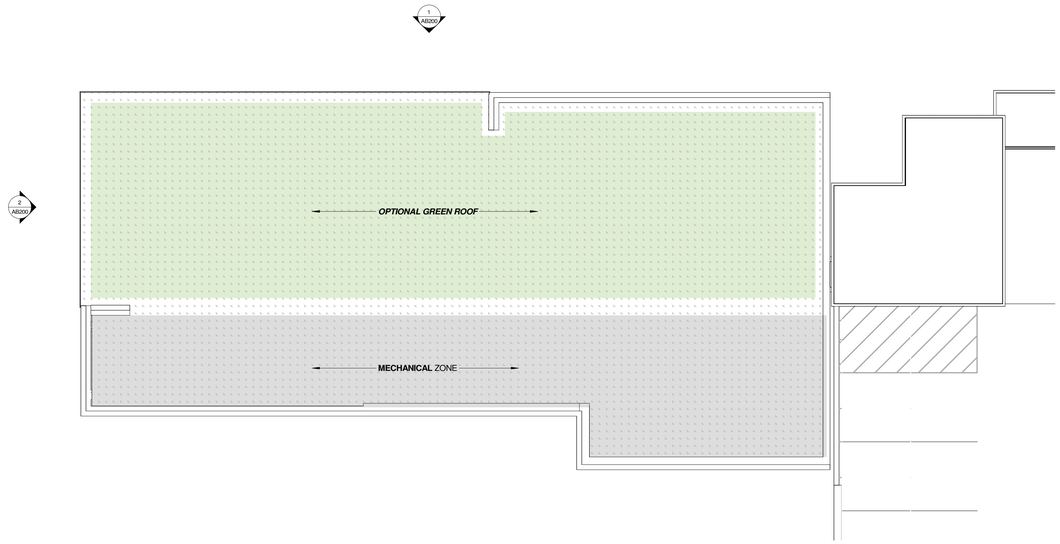
N

A/B_05 FIFTH FLOOR
SCALE: 1/8" = 1'-0"



N

A/B SECOND | THIRD | FOURTH FLOOR PLAN
SCALE: 1/8" = 1'-0"



N

A/B_06 ROOF PLAN
SCALE: 1/8" = 1'-0"



N

A/B_01 FIRST FLOOR
SCALE: 1/8" = 1'-0"

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Traverse City, Michigan

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Drawn By	AL
Designer	JD
Reviewer	AL
Manager	AL

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PROJECT NO.
231082

SHEET NO.
AB101

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N

(A/B) ENLARGED TYP. UNIT PLAN

SCALE: 1/4" = 1'-0"

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1 AB200 **A/B NORTH ELEVATION**
SCALE: 1/8" = 1'-0"



2 AB200 **A/B WEST ELEVATION**
SCALE: 1/8" = 1'-0"

KEY PLAN



3 AB200 **A/B BUILDING VIEW DOWN ALLEY**
SCALE:

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Drawn By AL
Designer JD
Reviewer AL
Manager AL

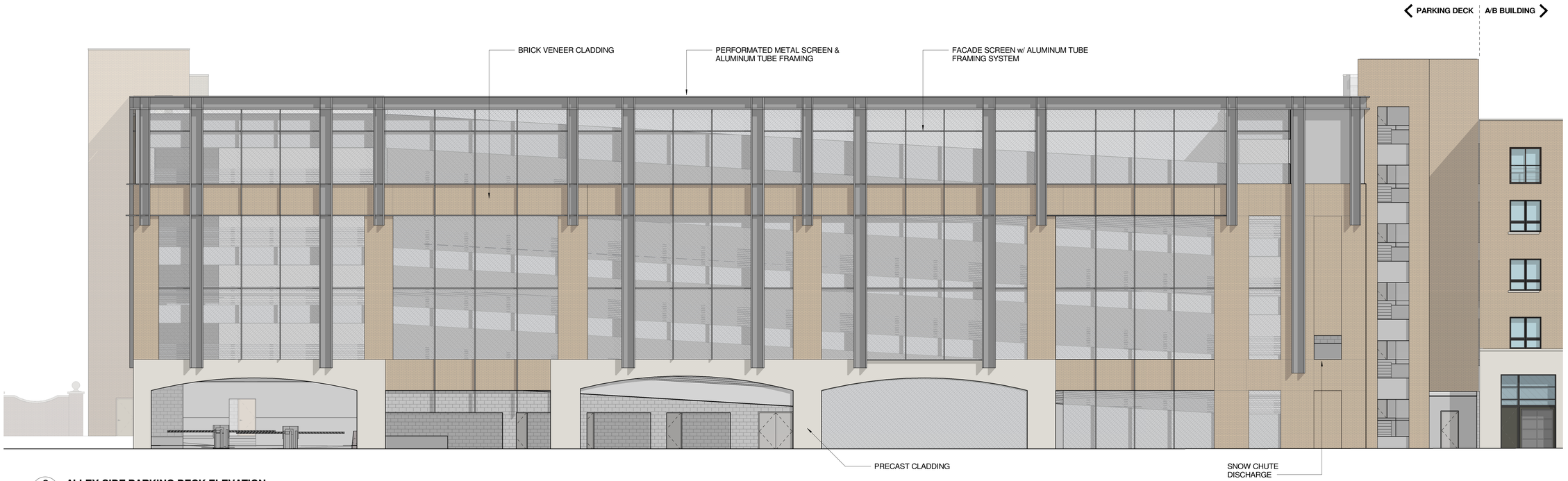
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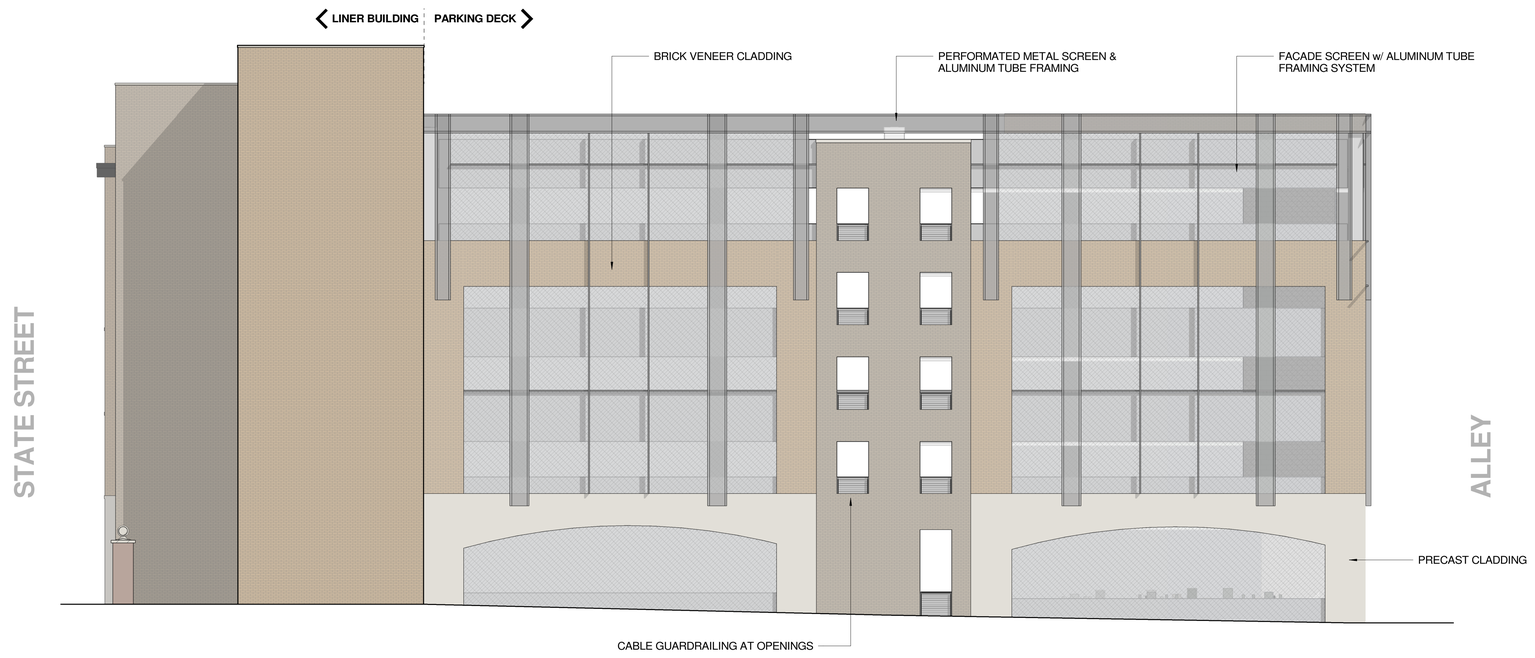
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2 AC200 **ALLEY-SIDE PARKING DECK ELEVATION**
SCALE: 1/8" = 1'-0"



1 AC200 **EAST PARKING DECK ELEVATION**
SCALE: 1/8" = 1'-0"

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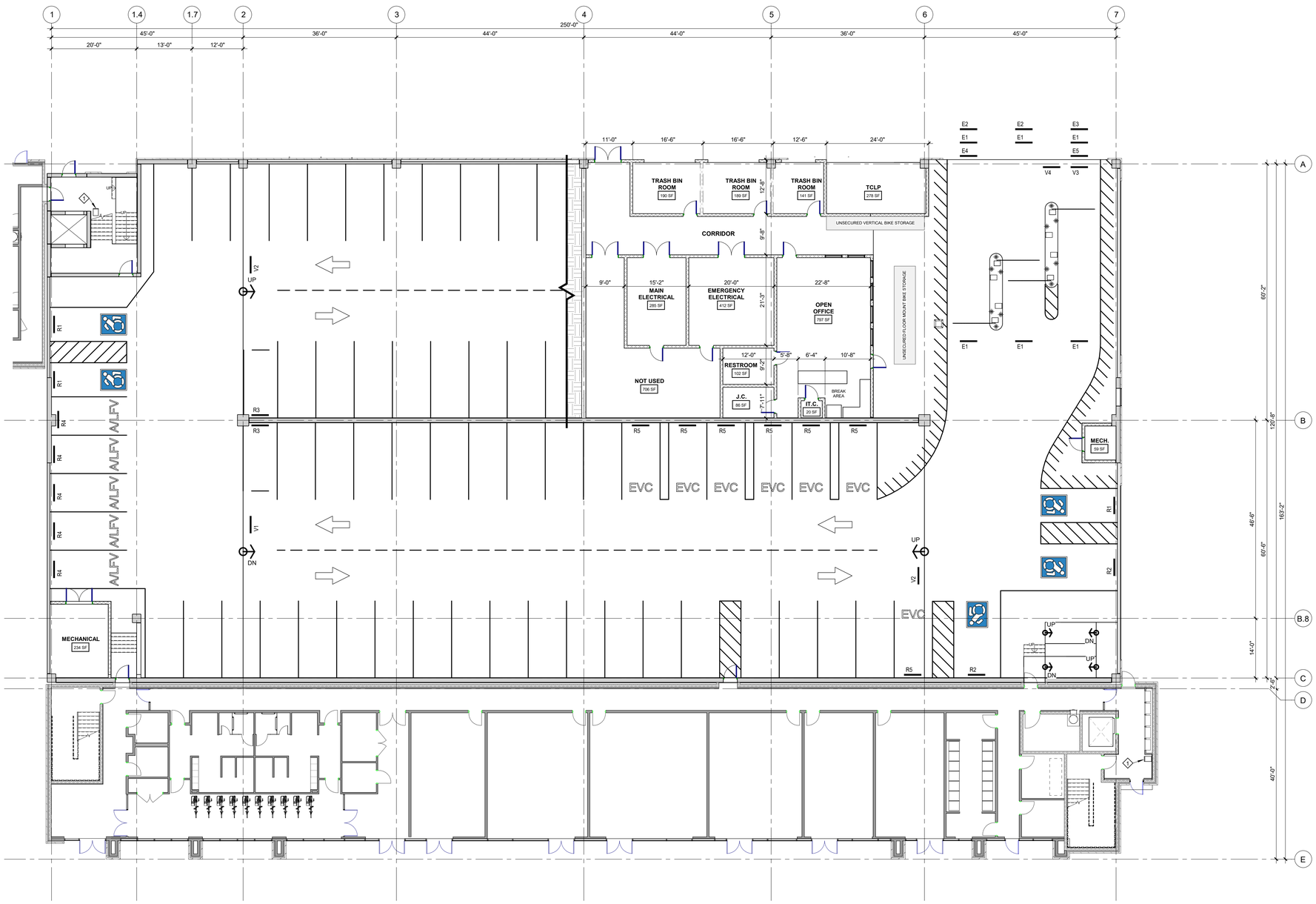
Drawn By	AL
Designer	JD
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AC200

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LEVEL 1 PLAN

SCALE: 3/32" = 1'-0"

NORTH

SPACE TABULATION

LEVEL	STANDARD	COMPACT	ADA	ADA VAN	EVC	A/LFV	TOTAL
6	75	3	0	0	0	0	78
5	93	5	0	0	0	0	98
4	83	5	0	0	0	0	88
3	87	4	2	0	0	4	97
2	85	4	4	0	0	4	97
1	47	2	3	2	7	5	66
TOTAL	480	23	9	2	7	13	534

PLAN SYMBOLS - ARCHITECTURAL PARKING

- PLAN MATCH LINE (RAMP)
- UP — RAMP HINGE LINE - **UP** INDICATES THE SURFACE SLOPES UP. **DN** INDICATES THE SURFACE SLOPES DOWN.
- XXX - X — SIGN; THE FIRST SET OF CHARACTERS IS THE SIGN MARK, REFER TO SIGN LEGEND. THE SECOND DIGIT IS THE SIGN MOUNTING MARK, REFER TO SIGN MOUNTING SCHEDULE. SIGN TO BE PLACED AS SHOWN ON PLAN.
- PRECAST CONCRETE BOLLARD, REFER TO SHEET XXXX FOR ADDITIONAL INFORMATION.
- 6"ø ROUND STEEL POST BOLLARD, REFER TO STRUCTURAL AND SHEET XXXX FOR ADDITIONAL INFORMATION.

PLAN NOTES - ARCHITECTURAL PARKING

1. FOR GENERAL NOTES AND EXPLANATION OF NOTATIONS AND ABBREVIATIONS, REFER TO SHEET XXXX.
2. ALL SIGNS LOCATED AT ENTRY/EXIT SHALL BE CENTERED IN LANES, TYPICAL.
3. UNDERSIDE OF ALL CONCRETE FLOOR SHALL RECIEVE WHITE CONCRETE STAIN. AREA TO INCLUDE BEAM OR GIRDER DEPTH. PROVIDE STAIN ON VISIBLE FACES OF CMU WALLS SURROUNDING ELEVATOR DOORS. REFER TO SPEC SECTION 09 91 00 FOR ADDITIONAL INFORMATION.

KEY NOTES

1 PAY-ON-FOOT STATION

SIGN LEGEND

NOTE - REFER TO DETAIL 1/AP911 FOR EXAMPLE SIGNS AND ADDITIONAL INFORMATION.

ENTRY-EXIT SIGNS

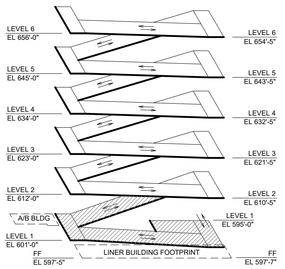
MARK	MESSAGE	DETAIL
E1	↓ / ↑	4/AP911
E2	8'-2" Clearance 8'-2"	2/AP911
E3	[D] Do Not Enter [D]	3/AP911
E4	ENTER	
E5	EXIT	

VEHICULAR SIGNS

MARK	MESSAGE	DETAIL
V1	Park →	5/AP911
V2	← Exit	6/AP911
V3	To Union St →	7/AP911
V4	← To Pine St	8/AP911

REGULATORY SIGNS

MARK	MESSAGE	DETAIL
R1	[A] Accessible Space	9/AP911
R2	[A] Accessible Van Space	10/AP911
R3	Compact Space: Do Not Overhang Rear Line	11/AP911
R4	Alternate & Low-Emission Fuel Vehicle Space	12/AP911
R5	[C] Electric Vehicle Charging Space	13/AP911



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Designer FGE
Reviewer JAR
Manager JAR

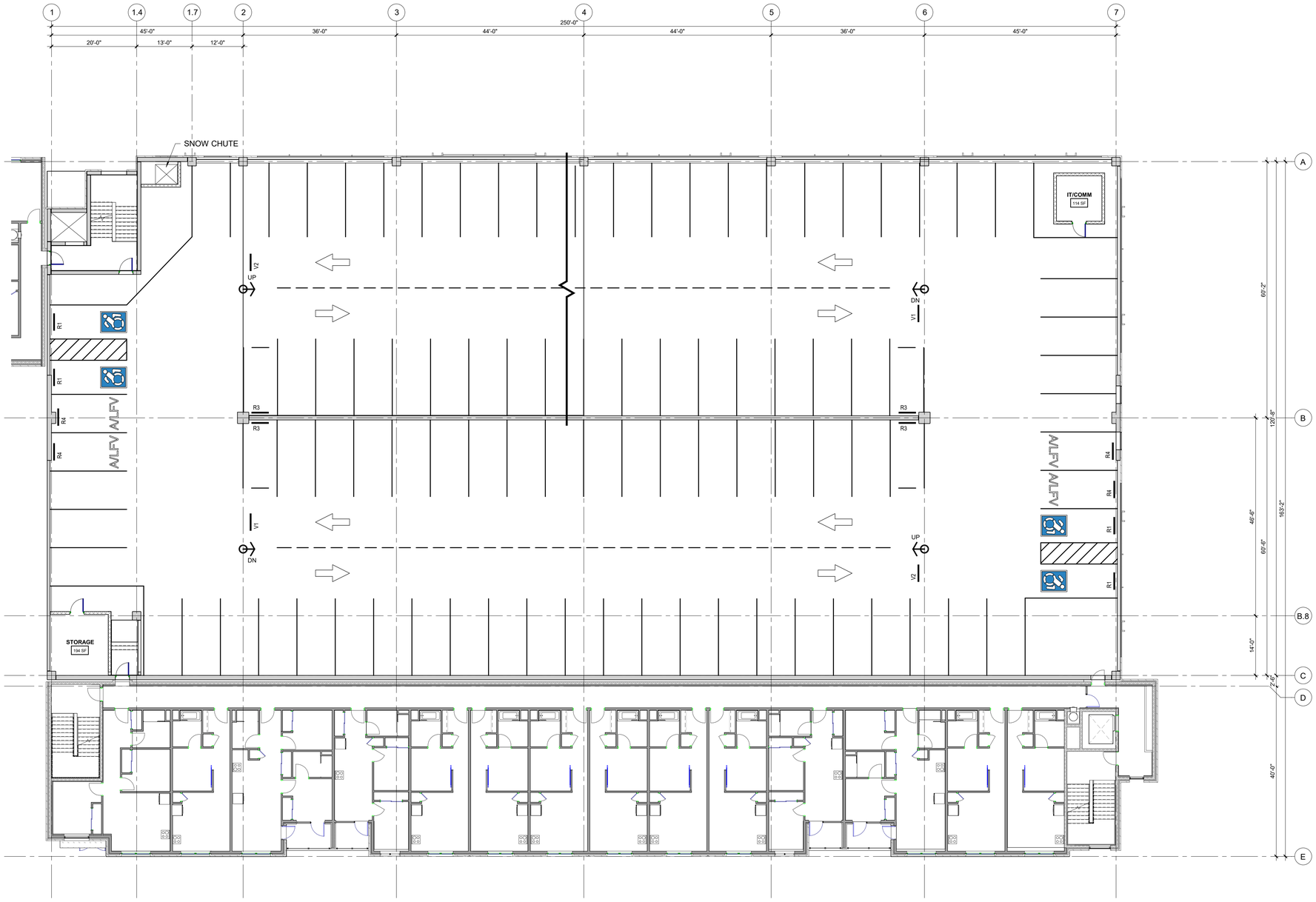
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LEVEL 2 PLAN

SCALE: 3/32" = 1'-0"

NORTH

PLAN SYMBOLS - ARCHITECTURAL PARKING

PLAN MATCH LINE (RAMP)

UP — RAMP HINGE LINE - **UP** INDICATES THE SURFACE SLOPES UP. **DN** INDICATES THE SURFACE SLOPES DOWN.

XXX • X — SIGN; THE FIRST SET OF CHARACTERS IS THE SIGN MARK, REFER TO SIGN LEGEND. THE SECOND DIGIT IS THE SIGN MOUNTING MARK, REFER TO SIGN MOUNTING SCHEDULE. SIGN TO BE PLACED AS SHOWN ON PLAN.

PRECAST CONCRETE BOLLARD, REFER TO SHEET XXXX FOR ADDITIONAL INFORMATION.

6"ø ROUND STEEL POST BOLLARD, REFER TO STRUCTURAL AND SHEET XXXX FOR ADDITIONAL INFORMATION.

PLAN NOTES - ARCHITECTURAL PARKING

1. FOR GENERAL NOTES AND EXPLANATION OF NOTATIONS AND ABBREVIATIONS, REFER TO SHEET XXXX.
2. ALL SIGNS LOCATED AT ENTRY/EXIT SHALL BE CENTERED IN LANES, TYPICAL.
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KEY NOTES

1 PAY-ON-FOOT STATION

SIGN LEGEND

NOTE - REFER TO DETAIL 1/AP911 FOR EXAMPLE SIGNS AND ADDITIONAL INFORMATION.

ENTRY-EXIT SIGNS

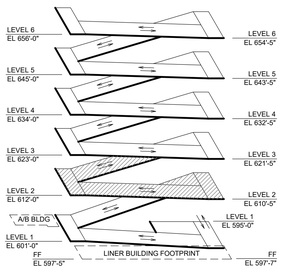
MARK	MESSAGE	DETAIL
E1	↓ / ↑	4/AP911
E2	8'-2" Clearance 8'-2"	2/AP911
E3	[D] Do Not Enter [D]	3/AP911
E4	ENTER	
E5	EXIT	

VEHICULAR SIGNS

MARK	MESSAGE	DETAIL
V1	Park →	5/AP911
V2	← Exit	6/AP911
V3	To Union St →	7/AP911
V4	← To Pine St	8/AP911

REGULATORY SIGNS

MARK	MESSAGE	DETAIL
R1	[A] Accessible Space	9/AP911
R2	[A] Accessible Van Space	10/AP911
R3	Compact Space: Do Not Overhang Rear Line	11/AP911
R4	Alternate & Low-Emission Fuel Vehicle Space	12/AP911
R5	[C] Electric Vehicle Charging Space	13/AP911



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Drawn By	DEB
Designer	FGE
Reviewer	JAR
Manager	JAR

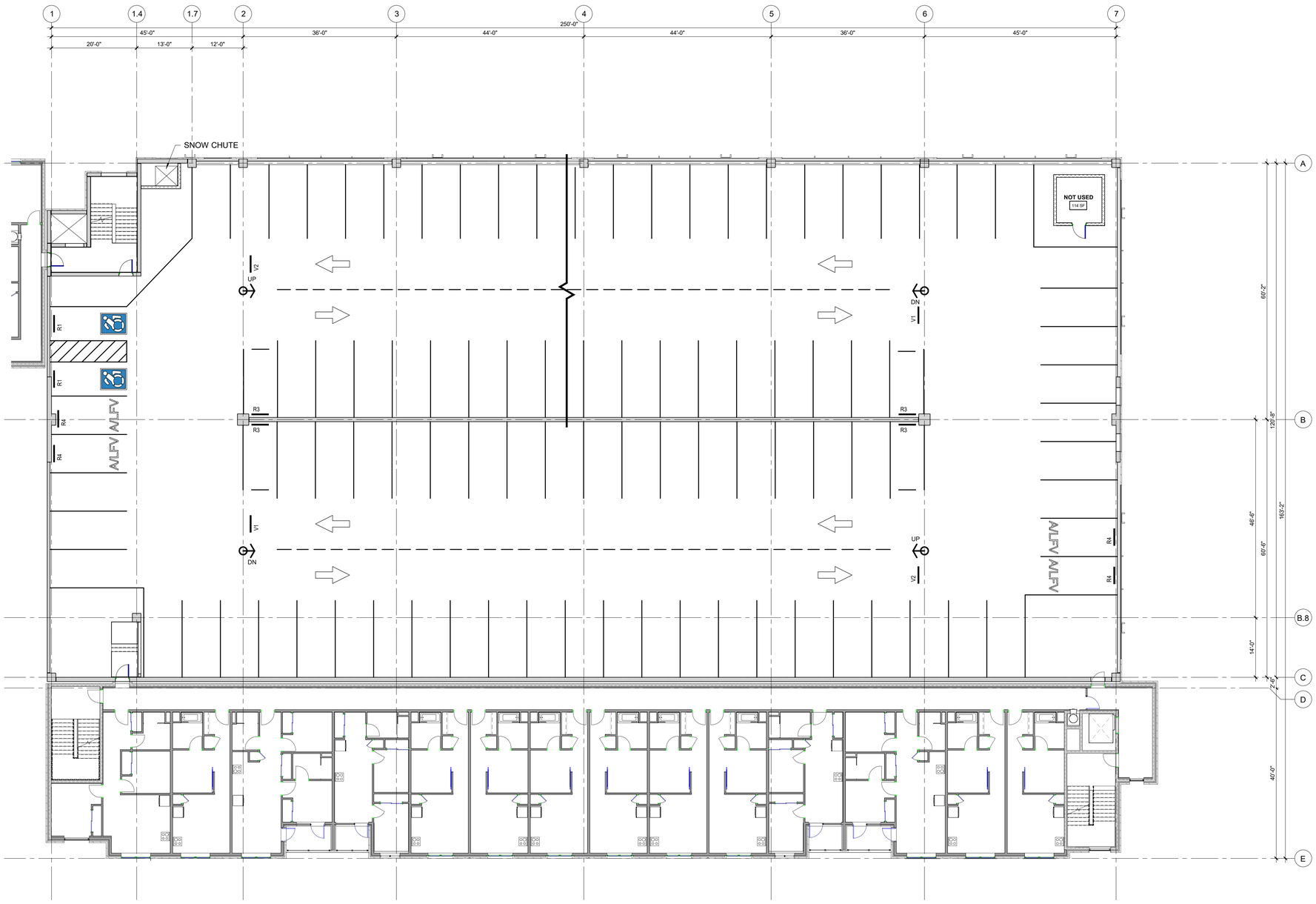
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LEVEL 3 PLAN

SCALE: 3/32" = 1'-0"

NORTH

PLAN SYMBOLS - ARCHITECTURAL PARKING

PLAN MATCH LINE (RAMP)

UP — RAMP HINGE LINE - **UP** INDICATES THE SURFACE SLOPES UP. **DN** INDICATES THE SURFACE SLOPES DOWN.

XXX • X — SIGN; THE FIRST SET OF CHARACTERS IS THE SIGN MARK, REFER TO SIGN LEGEND. THE SECOND DIGIT IS THE SIGN MOUNTING MARK, REFER TO SIGN MOUNTING SCHEDULE. SIGN TO BE PLACED AS SHOWN ON PLAN.

PRECAST CONCRETE BOLLARD, REFER TO SHEET XXXX FOR ADDITIONAL INFORMATION.

6"ø ROUND STEEL POST BOLLARD, REFER TO STRUCTURAL AND SHEET XXXX FOR ADDITIONAL INFORMATION.

PLAN NOTES - ARCHITECTURAL PARKING

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KEY NOTES

1 PAY-ON-FOOT STATION

SIGN LEGEND

NOTE - REFER TO DETAIL 1/AP911 FOR EXAMPLE SIGNS AND ADDITIONAL INFORMATION.

ENTRY-EXIT SIGNS

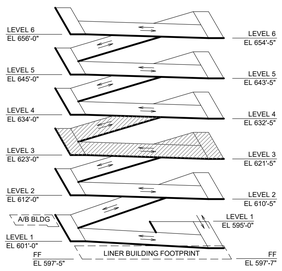
MARK	MESSAGE	DETAIL
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E2	8'-2" Clearance 8'-2"	2/AP911
E3	[D] Do Not Enter [D]	3/AP911
E4	ENTER	
E5	EXIT	

VEHICULAR SIGNS

MARK	MESSAGE	DETAIL
V1	Park →	5/AP911
V2	← Exit	6/AP911
V3	To Union St →	7/AP911
V4	← To Pine St	8/AP911

REGULATORY SIGNS

MARK	MESSAGE	DETAIL
R1	[A] Accessible Space	9/AP911
R2	[A] Accessible Van Space	10/AP911
R3	Compact Space: Do Not Overhang Rear Line	11/AP911
R4	Alternate & Low-Emission Fuel Vehicle Space	12/AP911
R5	[C] Electric Vehicle Charging Space	13/AP911



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Designer	FGE
Reviewer	JAR
Manager	JAR

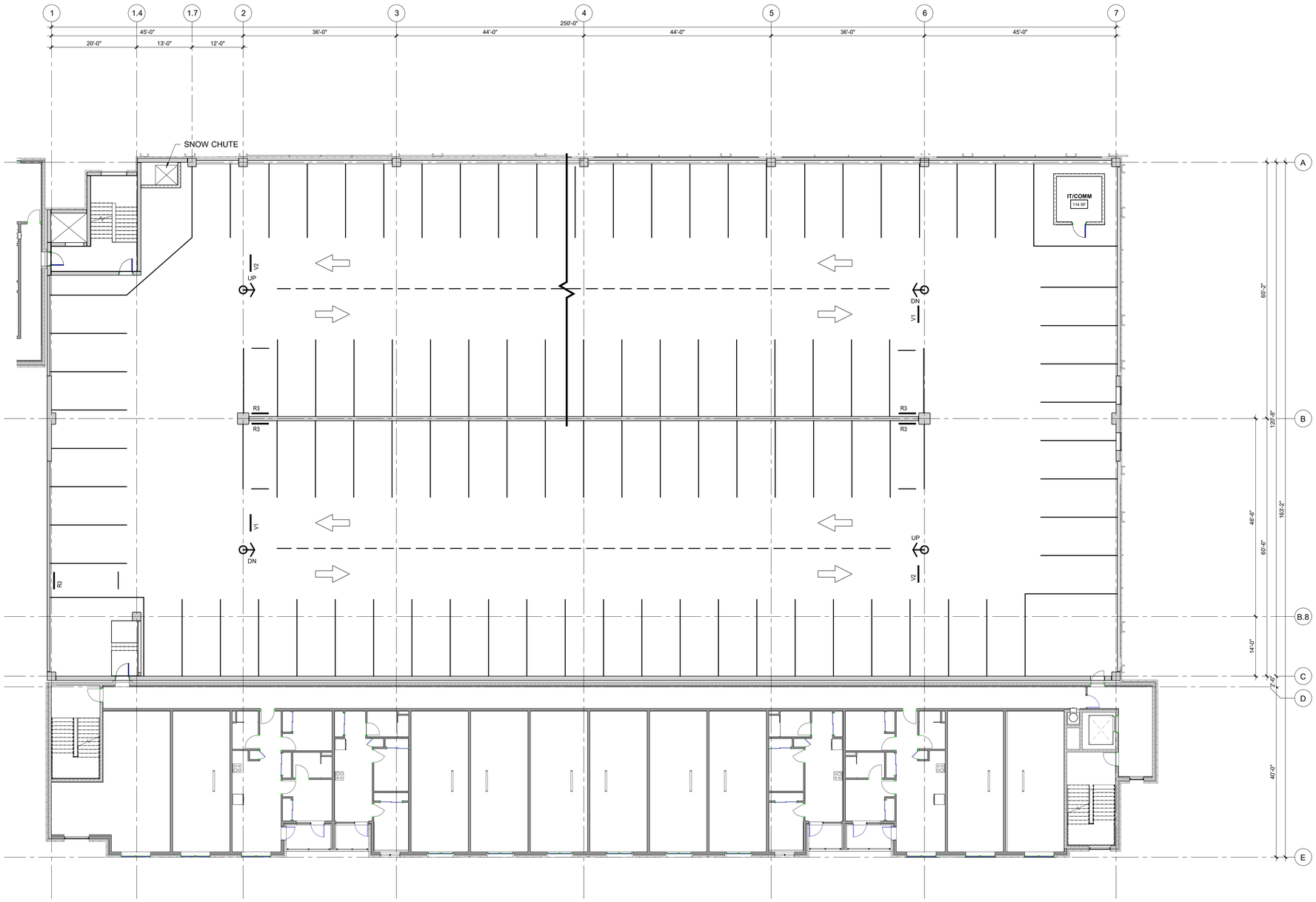
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LEVEL 4 PLAN

SCALE: 3/32" = 1'-0"

NORTH

PLAN SYMBOLS - ARCHITECTURAL PARKING

PLAN MATCH LINE (RAMP)

UP — RAMP HINGE LINE - **UP** INDICATES THE SURFACE SLOPES UP. **DN** INDICATES THE SURFACE SLOPES DOWN.

XXX • X — SIGN; THE FIRST SET OF CHARACTERS IS THE SIGN MARK, REFER TO SIGN LEGEND. THE SECOND DIGIT IS THE SIGN MOUNTING MARK, REFER TO SIGN MOUNTING SCHEDULE. SIGN TO BE PLACED AS SHOWN ON PLAN.

PRECAST CONCRETE BOLLARD, REFER TO SHEET XXXX FOR ADDITIONAL INFORMATION.

6"ø ROUND STEEL POST BOLLARD, REFER TO STRUCTURAL AND SHEET XXXX FOR ADDITIONAL INFORMATION.

PLAN NOTES - ARCHITECTURAL PARKING

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(#) KEY NOTES

1 PAY-ON-FOOT STATION

SIGN LEGEND

NOTE - REFER TO DETAIL 1/AP911 FOR EXAMPLE SIGNS AND ADDITIONAL INFORMATION.

ENTRY-EXIT SIGNS

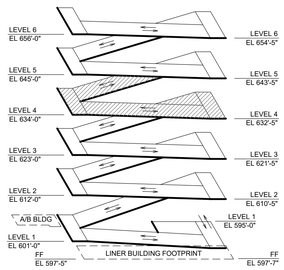
MARK	MESSAGE	DETAIL
E1	-/- / X	4/AP911
E2	8'-2" Clearance 8'-2"	2/AP911
E3	[D] Do Not Enter [D]	3/AP911
E4	ENTER	
E5	EXIT	

VEHICULAR SIGNS

MARK	MESSAGE	DETAIL
V1	Park →	5/AP911
V2	← Exit	6/AP911
V3	To Union St →	7/AP911
V4	← To Pine St	8/AP911

REGULATORY SIGNS

MARK	MESSAGE	DETAIL
R1	[A] Accessible Space	9/AP911
R2	[A] Accessible Van Space	10/AP911
R3	Compact Space: Do Not Overhang Rear Line	11/AP911
R4	Alternate & Low-Emission Fuel Vehicle Space	12/AP911
R5	[C] Electric Vehicle Charging Space	13/AP911



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Designer	FGE
Reviewer	JAR
Manager	JAR

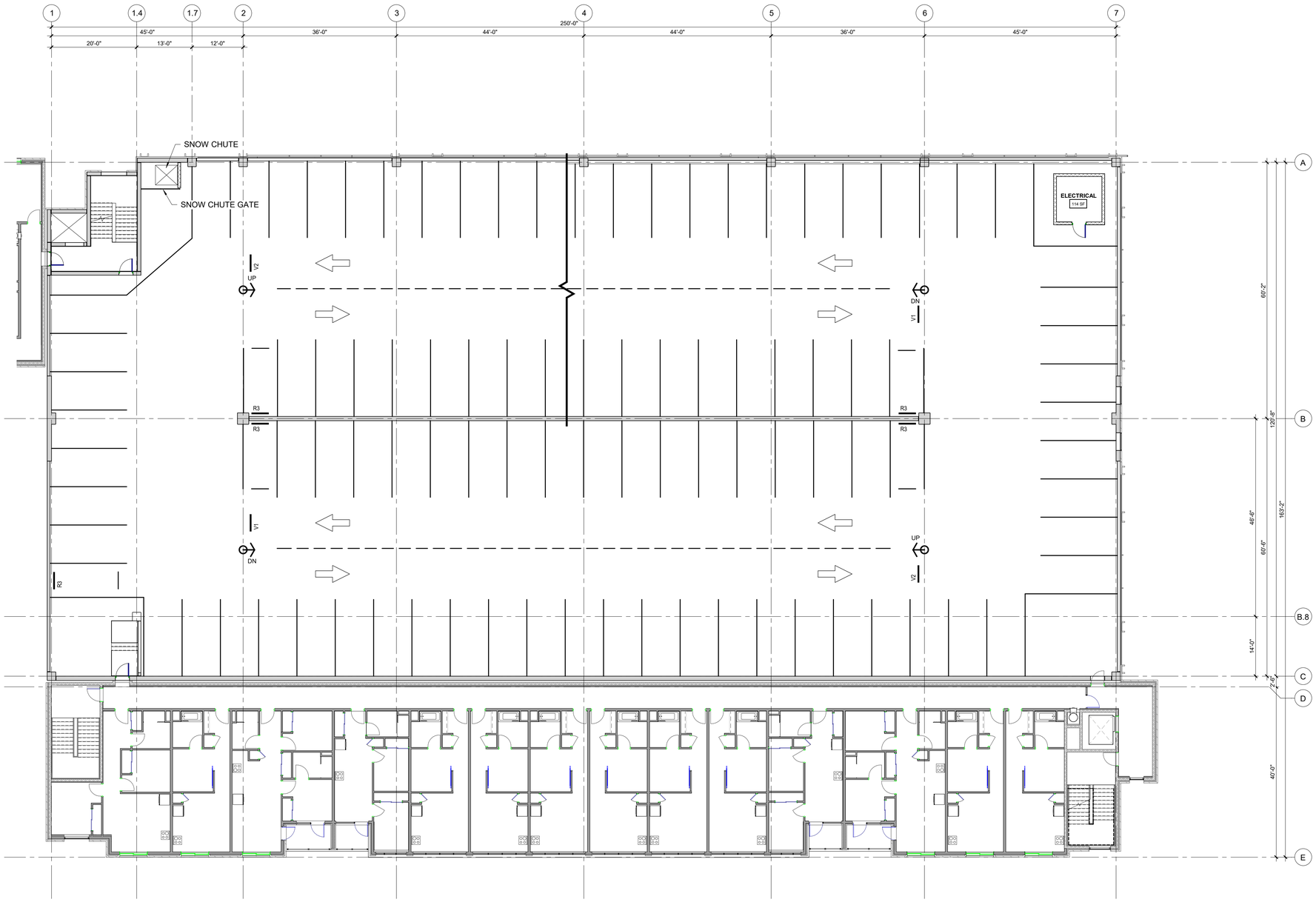
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LEVEL 5 PLAN

SCALE: 3/32" = 1'-0"

NORTH

PLAN SYMBOLS - ARCHITECTURAL PARKING

PLAN MATCH LINE (RAMP)

UP — RAMP HINGE LINE - **UP** INDICATES THE SURFACE SLOPES UP. **DN** INDICATES THE SURFACE SLOPES DOWN.

XXX • X — SIGN; THE FIRST SET OF CHARACTERS IS THE SIGN MARK, REFER TO SIGN LEGEND. THE SECOND DIGIT IS THE SIGN MOUNTING MARK, REFER TO SIGN MOUNTING SCHEDULE. SIGN TO BE PLACED AS SHOWN ON PLAN.

PRECAST CONCRETE BOLLARD, REFER TO SHEET XXXX FOR ADDITIONAL INFORMATION.

6"ø ROUND STEEL POST BOLLARD, REFER TO STRUCTURAL AND SHEET XXXX FOR ADDITIONAL INFORMATION.

PLAN NOTES - ARCHITECTURAL PARKING

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KEY NOTES

1 PAY-ON-FOOT STATION

SIGN LEGEND

NOTE - REFER TO DETAIL 1/AP911 FOR EXAMPLE SIGNS AND ADDITIONAL INFORMATION.

ENTRY-EXIT SIGNS

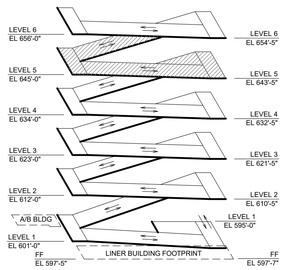
MARK	MESSAGE	DETAIL
E1	↓ / ↑	4/AP911
E2	8'-2" Clearance 8'-2"	2/AP911
E3	[D] Do Not Enter [D]	3/AP911
E4	ENTER	
E5	EXIT	

VEHICULAR SIGNS

MARK	MESSAGE	DETAIL
V1	Park →	5/AP911
V2	← Exit	6/AP911
V3	To Union St →	7/AP911
V4	← To Pine St	8/AP911

REGULATORY SIGNS

MARK	MESSAGE	DETAIL
R1	[A] Accessible Space	9/AP911
R2	[A] Accessible Van Space	10/AP911
R3	Compact Space: Do Not Overhang Rear Line	11/AP911
R4	Alternate & Low-Emission Fuel Vehicle Space	12/AP911
R5	[C] Electric Vehicle Charging Space	13/AP911



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Drawn By	DEB
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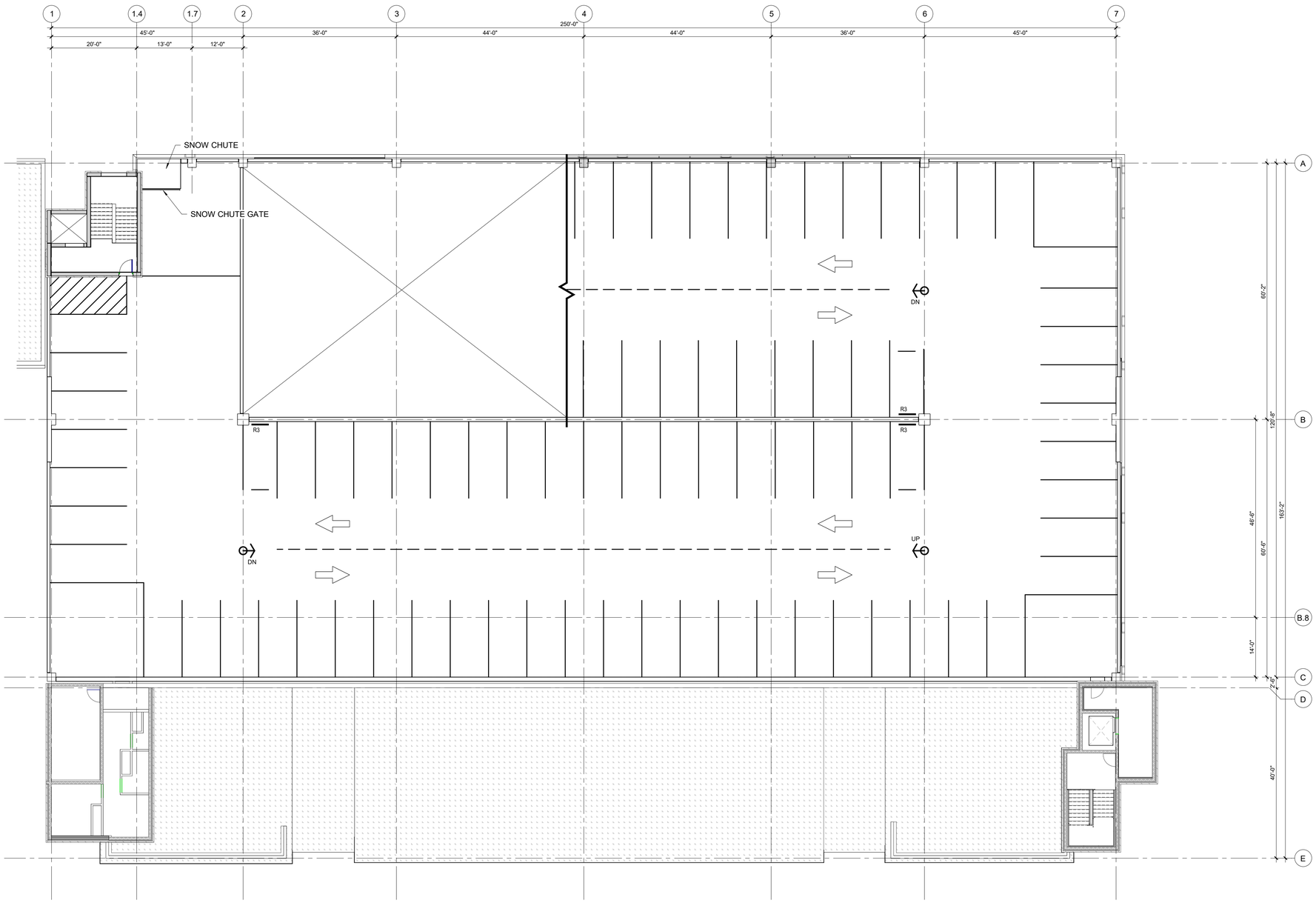
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LEVEL 6 PLAN

SCALE: 3/32" = 1'-0"

NORTH

PLAN SYMBOLS - ARCHITECTURAL PARKING

PLAN MATCH LINE (RAMP)

UP

RAMP HINGE LINE - **UP** INDICATES THE SURFACE SLOPES UP. **DN** INDICATES THE SURFACE SLOPES DOWN.

XXX - X

SIGN; THE FIRST SET OF CHARACTERS IS THE SIGN MARK, REFER TO SIGN LEGEND. THE SECOND DIGIT IS THE SIGN MOUNTING MARK, REFER TO SIGN MOUNTING SCHEDULE. SIGN TO BE PLACED AS SHOWN ON PLAN.

PRECAST CONCRETE BOLLARD, REFER TO SHEET XXXX FOR ADDITIONAL INFORMATION.

6"ø ROUND STEEL POST BOLLARD, REFER TO STRUCTURAL AND SHEET XXXX FOR ADDITIONAL INFORMATION.

PLAN NOTES - ARCHITECTURAL PARKING

1. FOR GENERAL NOTES AND EXPLANATION OF NOTATIONS AND ABBREVIATIONS, REFER TO SHEET XXXX.
2. ALL SIGNS LOCATED AT ENTRY/EXIT SHALL BE CENTERED IN LANES, TYPICAL.
3. UNDERSIDE OF ALL CONCRETE FLOOR SHALL RECIEVE WHITE CONCRETE STAIN. AREA TO INCLUDE BEAM OR GIRDER DEPTH. PROVIDE STAIN ON VISIBLE FACES OF CMU WALLS SURROUNDING ELEVATOR DOORS. REFER TO SPEC SECTION 09 91 00 FOR ADDITIONAL INFORMATION.

KEY NOTES

1 PAY-ON-FOOT STATION

SIGN LEGEND

NOTE - REFER TO DETAIL 1/AP911 FOR EXAMPLE SIGNS AND ADDITIONAL INFORMATION.

ENTRY-EXIT SIGNS

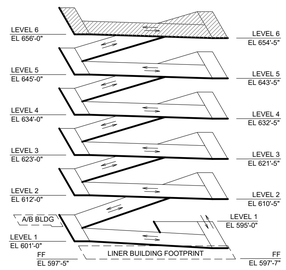
MARK	MESSAGE	DETAIL
E1	↓ / ✕	4/AP911
E2	8'-2" Clearance 8'-2"	2/AP911
E3	[D] Do Not Enter [D]	3/AP911
E4	ENTER	
E5	EXIT	

VEHICULAR SIGNS

MARK	MESSAGE	DETAIL
V1	Park →	5/AP911
V2	← Exit	6/AP911
V3	To Union St →	7/AP911
V4	← To Pine St	8/AP911

REGULATORY SIGNS

MARK	MESSAGE	DETAIL
R1	[A] Accessible Space	9/AP911
R2	[A] Accessible Van Space	10/AP911
R3	Compact Space: Do Not Overhang Rear Line	11/AP911
R4	Alternate & Low-Emission Fuel Vehicle Space	12/AP911
R5	[C] Electric Vehicle Charging Space	13/AP911



ISOMETRIC KEY PLAN

fishbeck
Engineers | Architects | Scientists | Constructors

City of Traverse City

Traverse City, Michigan

West End Mixed-Use Development

REVISIONS

NOT FOR CONSTRUCTION

03/20/2024 100% SCHEMATIC DESIGN

Drawn By DEB
Designer FGE
Reviewer JAR
Manager JAR

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PROJECT NO.
231082

SHEET NO.
AP106

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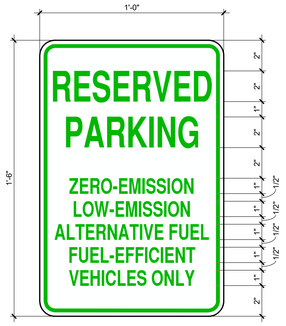
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NOTES:

1. REFER TO MUTCD STANDARD SIGN D9-11B FOR SIGN GRAPHICS, LAYOUT, AND SIZES.
2. REFER TO LEGEND FOR SIGN MOUNTING HEIGHT, UNLESS NOTED OTHERWISE ON PLANS.
3. REFER TO SPECIFICATION FOR ADDITIONAL INFORMATION.

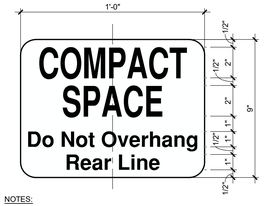
13 SIGN DETAIL
SCALE: 3" = 1'-0"



NOTES:

1. SIGN BACKGROUND COLOR WHITE.
2. SIGN COPY COLOR GREEN.
3. REFER TO LEGEND FOR SIGN MOUNTING HEIGHT, UNLESS NOTED OTHERWISE ON PLANS.
4. REFER TO SPECIFICATION FOR ADDITIONAL INFORMATION.

12 SIGN DETAIL
SCALE: 3" = 1'-0"



NOTES:

1. SIGN BACKGROUND COLOR TO BE WHITE.
2. SIGN COPY COLOR TO BE BLACK.
3. CENTER COPY ON WIDTH OF SIGN.
4. REFER TO LEGEND FOR SIGN MOUNTING HEIGHT, UNLESS NOTED OTHERWISE ON PLANS.
5. REFER TO SPECIFICATION FOR ADDITIONAL INFORMATION.

11 SIGN DETAIL
SCALE: 3" = 1'-0"



NOTES:

1. REFER TO MUTCD STANDARD SIGN D9-11B FOR SIGN GRAPHICS, LAYOUT, AND SIZES.
2. REFER TO LEGEND FOR SIGN MOUNTING HEIGHT, UNLESS NOTED OTHERWISE ON PLANS.
3. REFER TO SPECIFICATION FOR ADDITIONAL INFORMATION.

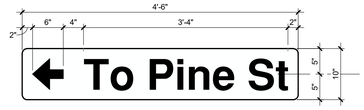
10 SIGN DETAIL
SCALE: 3" = 1'-0"



NOTES:

1. REFER TO MUTCD STANDARD SIGNS R7-8 AND R7-8P FOR SIGN GRAPHICS, LAYOUT, AND SIZES.
2. REFER TO LEGEND FOR SIGN MOUNTING HEIGHT, UNLESS NOTED OTHERWISE ON PLANS.
3. REFER TO SPECIFICATION FOR ADDITIONAL INFORMATION.

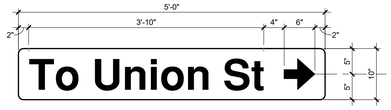
9 SIGN DETAIL
SCALE: 3" = 1'-0"



NOTES:

1. REFER TO COLOR CHART FOR SIGN BACKGROUND COLOR.
2. REFER TO COLOR CHART FOR SIGN COPY COLOR.
3. REFER TO SIGN COMPONENT DETAILS FOR TYPICAL SYMBOL DIMENSIONS, COLORS, AND GRAPHICS.
4. REFER TO LEGEND FOR SIGN MOUNTING HEIGHT, UNLESS NOTED OTHERWISE ON PLANS.
5. REFER TO SPECIFICATION FOR ADDITIONAL INFORMATION.

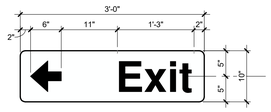
8 SIGN DETAIL
SCALE: 1" = 1'-0"



NOTES:

1. REFER TO COLOR CHART FOR SIGN BACKGROUND COLOR.
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3. REFER TO SIGN COMPONENT DETAILS FOR TYPICAL SYMBOL DIMENSIONS, COLORS, AND GRAPHICS.
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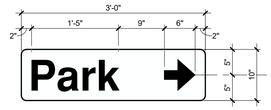
7 SIGN DETAIL
SCALE: 1" = 1'-0"



NOTES:

1. REFER TO COLOR CHART FOR SIGN BACKGROUND COLOR.
2. REFER TO COLOR CHART FOR SIGN COPY COLOR.
3. REFER TO SIGN COMPONENT DETAILS FOR TYPICAL SYMBOL DIMENSIONS, COLORS, AND GRAPHICS.
4. REFER TO LEGEND FOR SIGN MOUNTING HEIGHT, UNLESS NOTED OTHERWISE ON PLANS.
5. REFER TO SPECIFICATION FOR ADDITIONAL INFORMATION.

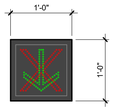
6 SIGN DETAIL
SCALE: 1" = 1'-0"



NOTES:

1. REFER TO COLOR CHART FOR SIGN BACKGROUND COLOR.
2. REFER TO COLOR CHART FOR SIGN COPY COLOR.
3. REFER TO SIGN COMPONENT DETAILS FOR TYPICAL SYMBOL DIMENSIONS, COLORS, AND GRAPHICS.
4. REFER TO LEGEND FOR SIGN MOUNTING HEIGHT, UNLESS NOTED OTHERWISE ON PLANS.
5. REFER TO SPECIFICATION FOR ADDITIONAL INFORMATION.

5 SIGN DETAIL
SCALE: 1" = 1'-0"



NOTES:

1. VARIABLE MESSAGE SIGN.
2. DOUBLE STROKE LED FOR ENTRY "ARROW", GREEN IN COLOR.
3. DOUBLE STROKE LED LETTERS FOR NO ENTRY "X", RED IN COLOR.
4. SIGNAL TECH SIGNS OR APPROVED EQUAL.
5. REFER TO LEGEND FOR SIGN MOUNTING HEIGHT, UNLESS NOTED OTHERWISE ON PLANS.
6. REFER TO SPECIFICATION FOR ADDITIONAL INFORMATION.

4 SIGN DETAIL
SCALE: 1" = 1'-0"



NOTES:

1. BLACK PVC PIPE WITH END CAPS.
2. WHITE AND RED FOR SIGN COPY AND GRAPHIC COLOR.
3. REFER TO SIGN COMPONENT DETAILS FOR TYPICAL SYMBOL DIMENSIONS, COLORS, AND GRAPHICS.
4. REFER TO LEGEND FOR SIGN MOUNTING HEIGHT, UNLESS NOTED OTHERWISE ON PLANS.
5. REFER TO SPECIFICATION FOR ADDITIONAL INFORMATION.

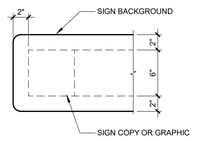
3 SIGN DETAIL
SCALE: 1" = 1'-0"



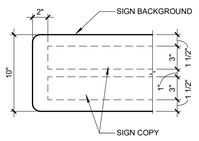
NOTES:

1. BLACK PVC PIPE WITH END CAPS.
2. WHITE FOR SIGN COPY COLOR.
3. REFER TO SIGN COMPONENT DETAILS FOR TYPICAL SYMBOL DIMENSIONS, COLORS, AND GRAPHICS.
4. REFER TO LEGEND FOR SIGN MOUNTING HEIGHT, UNLESS NOTED OTHERWISE ON PLANS.
5. REFER TO SPECIFICATION FOR ADDITIONAL INFORMATION.

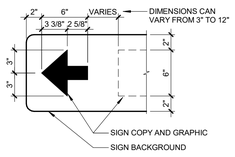
2 SIGN DETAIL
SCALE: 1" = 1'-0"



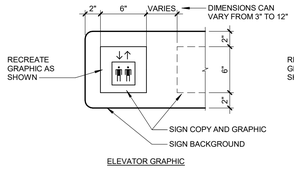
SINGLE LINE COPY - SIGN END
DOUBLE-LINE COPY AT MESSAGE DIVIDER



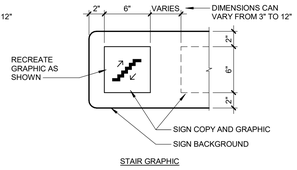
DOUBLE LINE COPY - SIGN END
DOUBLE-LINE COPY WITH NO DIVIDER



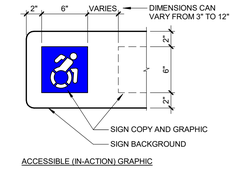
ARROW GRAPHIC



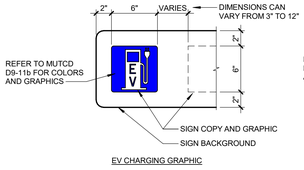
ELEVATOR GRAPHIC



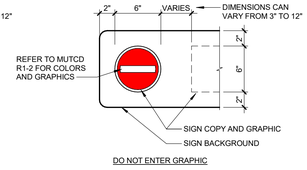
STAIR GRAPHIC



ACCESSIBLE (IN-ACTION) GRAPHIC

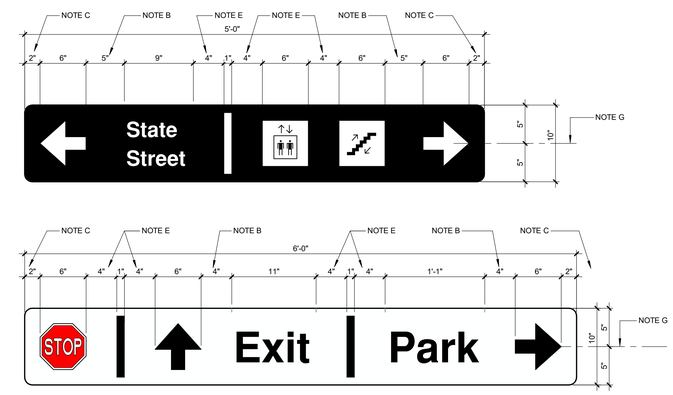


EV CHARGING GRAPHIC



DO NOT ENTER GRAPHIC

EXAMPLE SIGNS



DESIGN NOTES:

A. OVERHEAD SIGNS SHALL BE NO LESS THAN 3'-0" IN LENGTH. LENGTH OF SIGN SHOULD BE INCREMENTS OF 6" - NO ODD DIMENSIONED SIGN LENGTHS.
B. DISTANCE BETWEEN SYMBOL AND COPY CAN VARY TO ENSURE SIGN LENGTH CAN BE KEPT IN INCREMENTS OF 6".
C. END OF SIGN TO GRAPHIC/COPY TO BE 2".
D. MESSAGE DIVIDERS ARE 1" X 6". HOLD TOP AND BOTTOM OF DIVIDERS 1" FROM TOP AND BOTTOM OF SIGN.
E. HOLD COPY/GRAPHICS 4" AWAY HORIZONTALLY FROM DIVIDERS AND THEMSELVES.
F. ALL OVERHEAD SIGN COPY TO BE 3" OR 6" IN HEIGHT.
G. COPY AND GRAPHICS TO BE CENTERED ACROSS THE HEIGHT OF THE SIGN.
H. ALL SYMBOLS ARE 6' X 6" DIMENSIONALLY.

1 GRAPHIC COMPONENT DETAILS
SCALE: 1 1/2" = 1'-0"

fishbeck
Engineers | Architects | Scientists | Constructors

City of Traverse City
Traverse City, Michigan

West End Mixed-Use Development

REVISIONS

NOT FOR CONSTRUCTION

03/20/2024 100% SCHEMATIC DESIGN

Drawn By DEB
Designer FGE
Reviewer JAR
Manager JAR

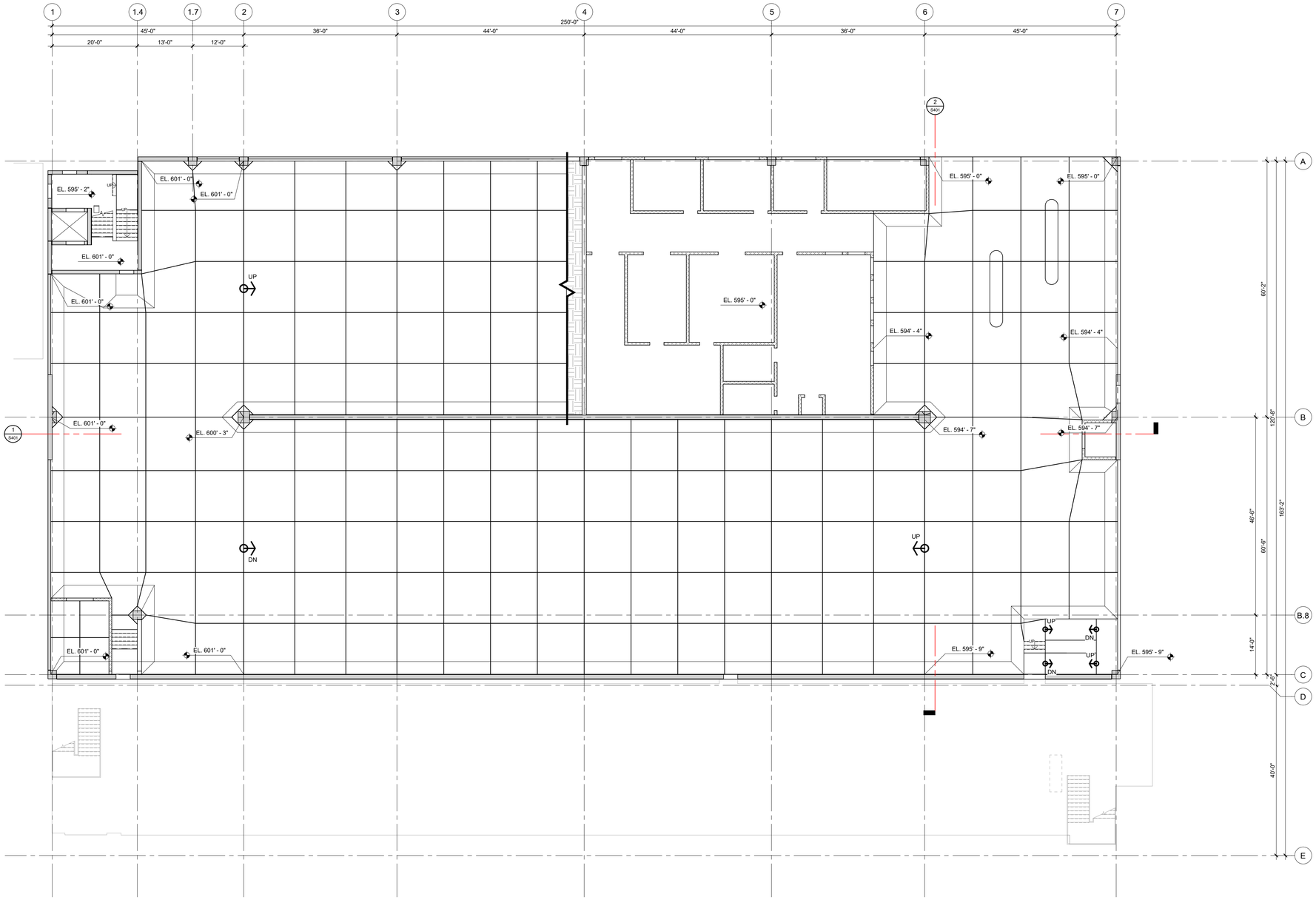
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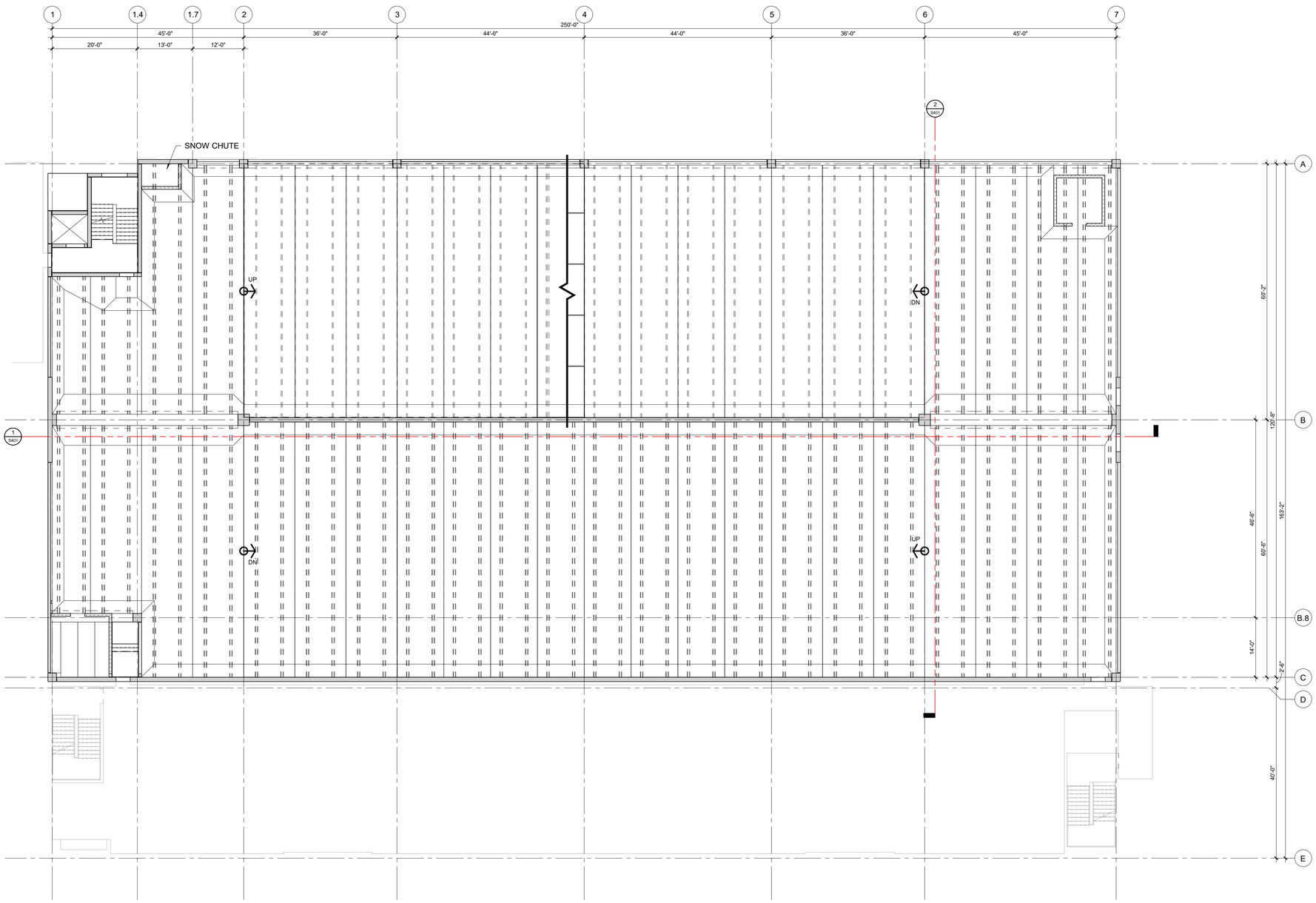
PROJECT NO.
231082

SHEET NO.
AP911

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PLOT INFO: 3/20/2024 9:40:43 AM


1
1.4
1.7
2
3
4
5
6
7
20'-0"
45'-0"
13'-0"
12'-0"
36'-0"
44'-0"
250'-0"
44'-0"
36'-0"
45'-0"
A
B
B.8
C
D
E
60'-2"
120'-8"
46'-6"
60'-6"
163'-2"
14'-0"
2'-6"
40'-0"
2
S401
1
S401
EL. 595' - 2"
EL. 601' - 0"
EL. 601' - 0"
EL. 601' - 0"
EL. 601' - 0"
EL. 601' - 0"
EL. 600' - 3"
EL. 601' - 0"
EL. 601' - 0"
EL. 595' - 0"
EL. 595' - 0"
EL. 595' - 0"
EL. 594' - 4"
EL. 594' - 4"
EL. 594' - 7"
EL. 594' - 7"
EL. 595' - 9"
EL. 595' - 9"
UP
DN
UP
DN
UP
DN



LEVEL 2 PLAN

SCALE: 3/32" = 1'-0"

NORTH

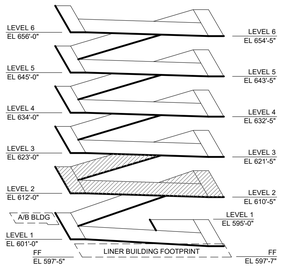
PLAN SYMBOLS

- PLAN MATCH LINE (RAMP)
- RAMP HINGE LINE - **UP** INDICATES THE SURFACE SLOPES UP. **DN** INDICATES THE SURFACE SLOPES DOWN.
- PRECAST CONCRETE BOLLARD, REFER TO SHEET XXXX FOR ADDITIONAL INFORMATION.
- 6"ø ROUND STEEL POST BOLLARD, REFER TO STRUCTURAL AND SHEET XXXX FOR ADDITIONAL INFORMATION.
- X — PLAN REINFORCEMENT AND MARK, REFER TO MILD STEEL SCHEDULE.
- FD — INDICATES FLOOR DRAIN, REFER TO DETAILS XXXX AND XXXX. FOR ADDITIONAL INFORMATION REFER TO PLUMBING DRAWINGS.
- INDICATES HEAVY DUTY TRAFFIC BEARING MEMBRANE (DECK COATING) OVER OCCUPIED SPACE (ELECTRICAL, MECHANICAL, DATA, STORAGE ROOMS, ETC) AS SHOWN ON THE DRAWINGS. REFER TO DETAILS XX/XXXX.
- FS — INDICATES FOOTING STEP, REFER TO DETAILS X & X/XXXX.
- WS — INDICATES WALL STEP. LOCATE STEPS AS SHOWN ON PLAN. A WALL CONTROL JOINT SHALL BE PROVIDED AT ALL STEP LOCATIONS.
- WJ — INDICATES WALL CONSTRUCTION/CONTROL JOINT LOCATION. PROVIDE WALL CONSTRUCTION/CONTROL JOINTS AT 20'-0" MAX OC OR AS SHOWN IN PLANS. REFER TO DETAIL XXXX/XX.
- CX — INDICATES COLUMN MARK. FOR COLUMN MARK DEFINITION REFER TO DETAILS ON SHEET XXXX.
- FX — INDICATES COLUMN FOOTING MARK. FOR FOOTING SIZE AND REINFORCEMENT REFER TO FOOTING SCHEDULE ON SHEET S100.
- WX — INDICATES WALL FOOTING MARK. FOR FOOTING SIZE AND REINFORCEMENT REFER TO FOOTING SCHEDULE ON SHEET S100.

PLAN NOTES

1. FOR GENERAL NOTES, EXPLANATION OF NOTATIONS, LOADING DIAGRAMS AND ABBREVIATIONS, REFER TO SHEETS XXXX.
2. COORDINATE ALL DIMENSIONS, DETAILS, FINISHES, TIE HOLE LOCATIONS, AND BLOCKOUTS WITH ALL OF THE PROJECT CONSULTANT DRAWINGS.
3. CONTRACTORS SHALL INCLUDE IN THEIR BIDS ALL NECESSARY ALLOWANCES FOR HOT AND COLD WEATHER CONCRETING (INCLUDING BUT NOT LIMITED TO NIGHT POURS, EVAPORATION REDUCTION, HEATING, BLANKETING, CONCRETE ADMIXTURES ETC) TO COMPLETE THE PROJECT AS SCHEDULED. REFER TO SPECIFICATION SECTION 03 31 26.
4. FLOOR ELEVATIONS AS INDICATED DESIGNATE TOP OF CONCRETE SLAB AT COLUMN CENTERLINE. ELEVATIONS DO NOT INCLUDE CONCRETE WASHES, BEAMS, CURBS, ETC. FOR ELEVATION KEY, REFER TO DETAIL X/XXXX. FOR FLOOR ELEVATIONS BETWEEN POINTS INDICATED, USE STRAIGHT LINE INTERPOLATION.
5. PROVIDE 1" GAP BETWEEN ALL FOUNDATION WALLS AND COLUMNS UNO. REFER TO DETAIL X/XXXX FOR MORE INFORMATION.
6. FOR STAIR AND ELEVATOR FOUNDATIONS AND DETAILS, REFER TO ENLARGED TOWER PLANS AND SHEETS XXXX AND XXXX.
7. FOR C.I.P. WALL DETAILS, REFER TO SHEETS XXXX THROUGH XXXX.
8. FOR COLUMN MARKS REFER TO SHEET XXXX AND ENLARGED PLANS. FOR COLUMN MARKS DEFINITION REFER TO DETAILS ON SHEET XXXX.
9. SLAB-ON-GRADE SHALL BE A MINIMUM OF 5" THICK CONCRETE OVER 6" MINIMUM MDOT CLASS II FILL. SLAB-ON-GRADE SHALL BE REINFORCED WITH EITHER STRUCTURAL MACRO FIBERS OR WWR AS INDICATED IN PLANS.
10. PROVIDE VAPOR BARRIER/RETARDER IMMEDIATELY BELOW CONCRETE SLAB-ON-GRADE FOR ALL ENCLOSED ROOMS. DO NOT PROVIDE VAPOR BARRIER/RETARDER IN PARKING AND DRIVE AREAS.
11. CONTROL JOINTS IN SLAB-ON-GRADE SHALL BE HAND-TOOLED OR SAW-CUT IN ACCORDANCE WITH DETAIL X/XXXX, TOOLED TO PROPER PROFILE, AND FILLED WITH SEALANT.
12. ROUT AND SEAL OR GRAVITY FEED EPOXY CRACKS IN THE SLAB-ON-GRADE, REFER TO DETAIL X/XXXX.
13. PROVIDE CONCRETE SEALER ON ON ALL SLAB SURFACES AND AS DESCRIBED IN GENERAL NOTE 7.1.
14. FOR SEALANT, DECK COATING, AND EXPANSION JOINT DETAILS, REFER TO SHEETS XXXX AND XXXX.
15. FOR MASONRY DETAILS, REFER TO SHEET XXXX.
16. ALL VERTICAL RISERS FOR PLUMBING, MECHANICAL, AND ELECTRICAL SSYTEMS SHLL BE PROTECTED WITH GALVANIZED PIPE GUARDS, REFER TO DETAIL X/XXXX.
17. REFER TO MECHANICAL, ELECTRICAL, PLUMBING, AND FIRE PROTECTION DRAWINGS FOR PIPE LOCATIONS. REFER TO GENERAL NOTE 1.8 FOR MINIMUM HEADROOM CLEARANCE
18. FOR TYPICAL PCC DETAILS REFER TO SHEETS XXXX THROUGH XXXX.

(#) KEY NOTES



ISOMETRIC KEY PLAN

fishbeck
Engineers | Architects | Scientists | Constructors

City of Traverse City

Traverse City, Michigan

West End Mixed-Use Development

REVISIONS

NOT FOR CONSTRUCTION

03/20/2024 100% SCHEMATIC DESIGN

Drawn By	DEB
Designer	FGE
Reviewer	JAR
Manager	JAR

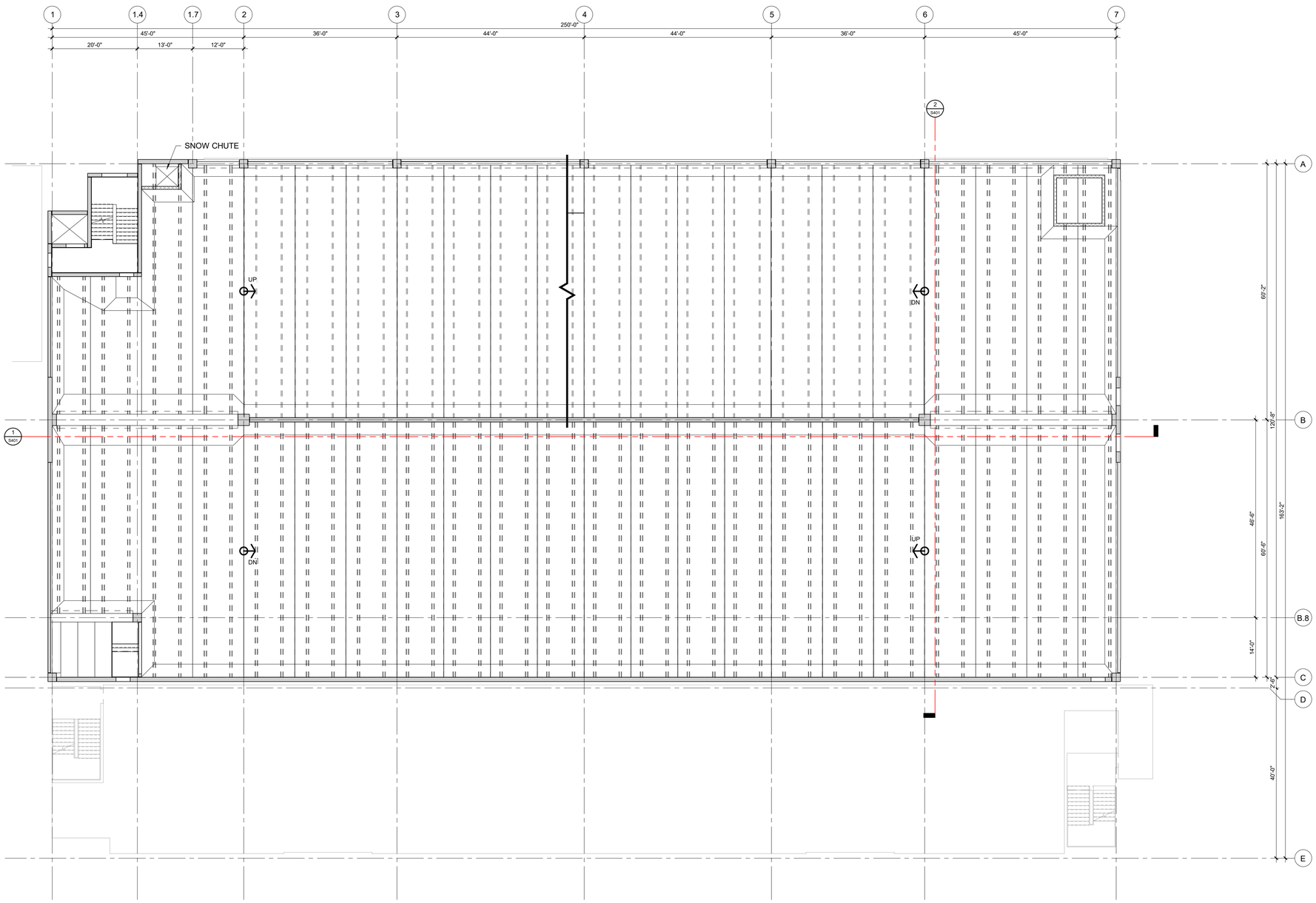
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PROJECT NO.
231082

SHEET NO.
S102

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LEVEL 3 PLAN

SCALE: 3/32" = 1'-0"

NORTH

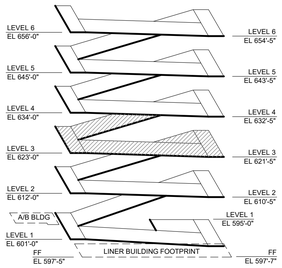
PLAN SYMBOLS

- PLAN MATCH LINE (RAMP)
- RAMP HINGE LINE - **UP** INDICATES THE SURFACE SLOPES UP. **DN** INDICATES THE SURFACE SLOPES DOWN.
- PRECAST CONCRETE BOLLARD, REFER TO SHEET XXXX FOR ADDITIONAL INFORMATION.
- 6"ø ROUND STEEL POST BOLLARD, REFER TO STRUCTURAL AND SHEET XXXX FOR ADDITIONAL INFORMATION.
- X — PLAN REINFORCEMENT AND MARK, REFER TO MILD STEEL SCHEDULE.
- FD — INDICATES FLOOR DRAIN, REFER TO DETAILS XXXX AND XXXX. FOR ADDITIONAL INFORMATION REFER TO PLUMBING DRAWINGS.
- INDICATES HEAVY DUTY TRAFFIC BEARING MEMBRANE (DECK COATING) OVER OCCUPIED SPACE (ELECTRICAL, MECHANICAL, DATA, STORAGE ROOMS, ETC) AS SHOWN ON THE DRAWINGS. REFER TO DETAILS XX/XXXX.
- FS — INDICATES FOOTING STEP, REFER TO DETAILS X & X/XXXX.
- WS — INDICATES WALL STEP. LOCATE STEPS AS SHOWN ON PLAN. A WALL CONTROL JOINT SHALL BE PROVIDED AT ALL STEP LOCATIONS.
- WJ — INDICATES WALL CONSTRUCTION/CONTROL JOINT LOCATION. PROVIDE WALL CONSTRUCTION/CONTROL JOINTS AT 20'-0" MAX OC OR AS SHOWN IN PLANS. REFER TO DETAIL XXXX/XX.
- CX — INDICATES COLUMN MARK. FOR COLUMN MARK DEFINITION REFER TO DETAILS ON SHEET XXXX.
- FX — INDICATES COLUMN FOOTING MARK. FOR FOOTING SIZE AND REINFORCEMENT REFER TO FOOTING SCHEDULE ON SHEET S100.
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PLAN NOTES

1. FOR GENERAL NOTES, EXPLANATION OF NOTATIONS, LOADING DIAGRAMS AND ABBREVIATIONS, REFER TO SHEETS XXXX.
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4. FLOOR ELEVATIONS AS INDICATED DESIGNATE TOP OF CONCRETE SLAB AT COLUMN CENTERLINE. ELEVATIONS DO NOT INCLUDE CONCRETE WASHES, BEAMS, CURBS, ETC. FOR ELEVATION KEY, REFER TO DETAIL X/XXXX. FOR FLOOR ELEVATIONS BETWEEN POINTS INDICATED, USE STRAIGHT LINE INTERPOLATION.
5. PROVIDE 1" GAP BETWEEN ALL FOUNDATION WALLS AND COLUMNS UNO. REFER TO DETAIL X/XXXX FOR MORE INFORMATION.
6. FOR STAIR AND ELEVATOR FOUNDATIONS AND DETAILS, REFER TO ENLARGED TOWER PLANS AND SHEETS XXXX AND XXXX.
7. FOR C.I.P. WALL DETAILS, REFER TO SHEETS XXXX THROUGH XXXX.
8. FOR COLUMN MARKS REFER TO SHEET XXXX AND ENLARGED PLANS. FOR COLUMN MARKS DEFINITION REFER TO DETAILS ON SHEET XXXX.
9. SLAB-ON-GRADE SHALL BE A MINIMUM OF 5" THICK CONCRETE OVER 6" MINIMUM MDOT CLASS II FILL. SLAB-ON-GRADE SHALL BE REINFORCED WITH EITHER STRUCTURAL MACRO FIBERS OR WWR AS INDICATED IN PLANS.
10. PROVIDE VAPOR BARRIER/RETARDER IMMEDIATELY BELOW CONCRETE SLAB-ON-GRADE FOR ALL ENCLOSED ROOMS. DO NOT PROVIDE VAPOR BARRIER/RETARDER IN PARKING AND DRIVE AREAS.
11. CONTROL JOINTS IN SLAB-ON-GRADE SHALL BE HAND-TOOLED OR SAW-CUT IN ACCORDANCE WITH DETAIL X/XXXX, TOOLED TO PROPER PROFILE, AND FILLED WITH SEALANT.
12. ROUT AND SEAL OR GRAVITY FEED EPOXY CRACKS IN THE SLAB-ON-GRADE, REFER TO DETAIL X/XXXX.
13. PROVIDE CONCRETE SEALER ON ON ALL SLAB SURFACES AND AS DESCRIBED IN GENERAL NOTE 7.1.
14. FOR SEALANT, DECK COATING, AND EXPANSION JOINT DETAILS, REFER TO SHEETS XXXX AND XXXX.
15. FOR MASONRY DETAILS, REFER TO SHEET XXXX.
16. ALL VERTICAL RISERS FOR PLUMBING, MECHANICAL, AND ELECTRICAL SSYTEMS SHLL BE PROTECTED WITH GALVANIZED PIPE GUARDS, REFER TO DETAIL X/XXXX.
17. REFER TO MECHANICAL, ELECTRICAL, PLUMBING, AND FIRE PROTECTION DRAWINGS FOR PIPE LOCATIONS. REFER TO GENERAL NOTE 1.8 FOR MINIMUM HEADROOM CLEARANCE
18. FOR TYPICAL PCC DETAILS REFER TO SHEETS XXXX THROUGH XXXX.

KEY NOTES



ISOMETRIC KEY PLAN

fishbeck
Engineers | Architects | Scientists | Constructors

City of Traverse City

Traverse City, Michigan

West End Mixed-Use Development

REVISIONS

NOT FOR CONSTRUCTION

03/20/2024 100% SCHEMATIC DESIGN

Drawn By DEB
Designer FGE
Reviewer JAR
Manager JAR

Hard copy is intended to be 30"x42" when plotted. Scale(s) indicated and graphic quality may not be accurate for any other size.

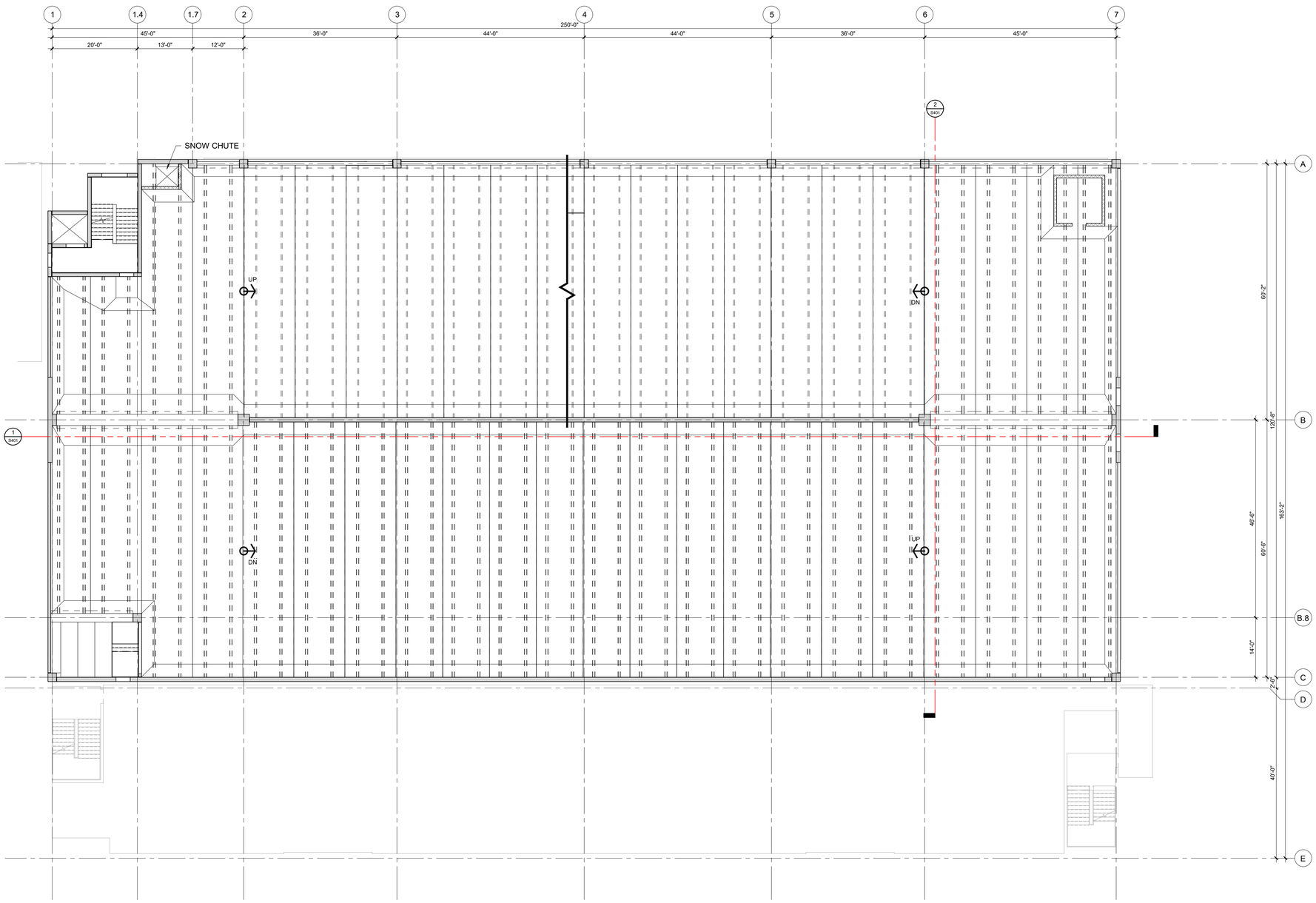
PROJECT NO.
231082

SHEET NO.

S103

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LEVEL 4 PLAN

SCALE: 3/32" = 1'-0"

NORTH

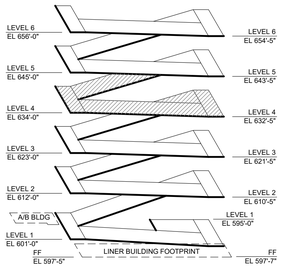
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- CX — INDICATES COLUMN MARK. FOR COLUMN MARK DEFINITION REFER TO DETAILS ON SHEET XXXX.
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PLAN NOTES

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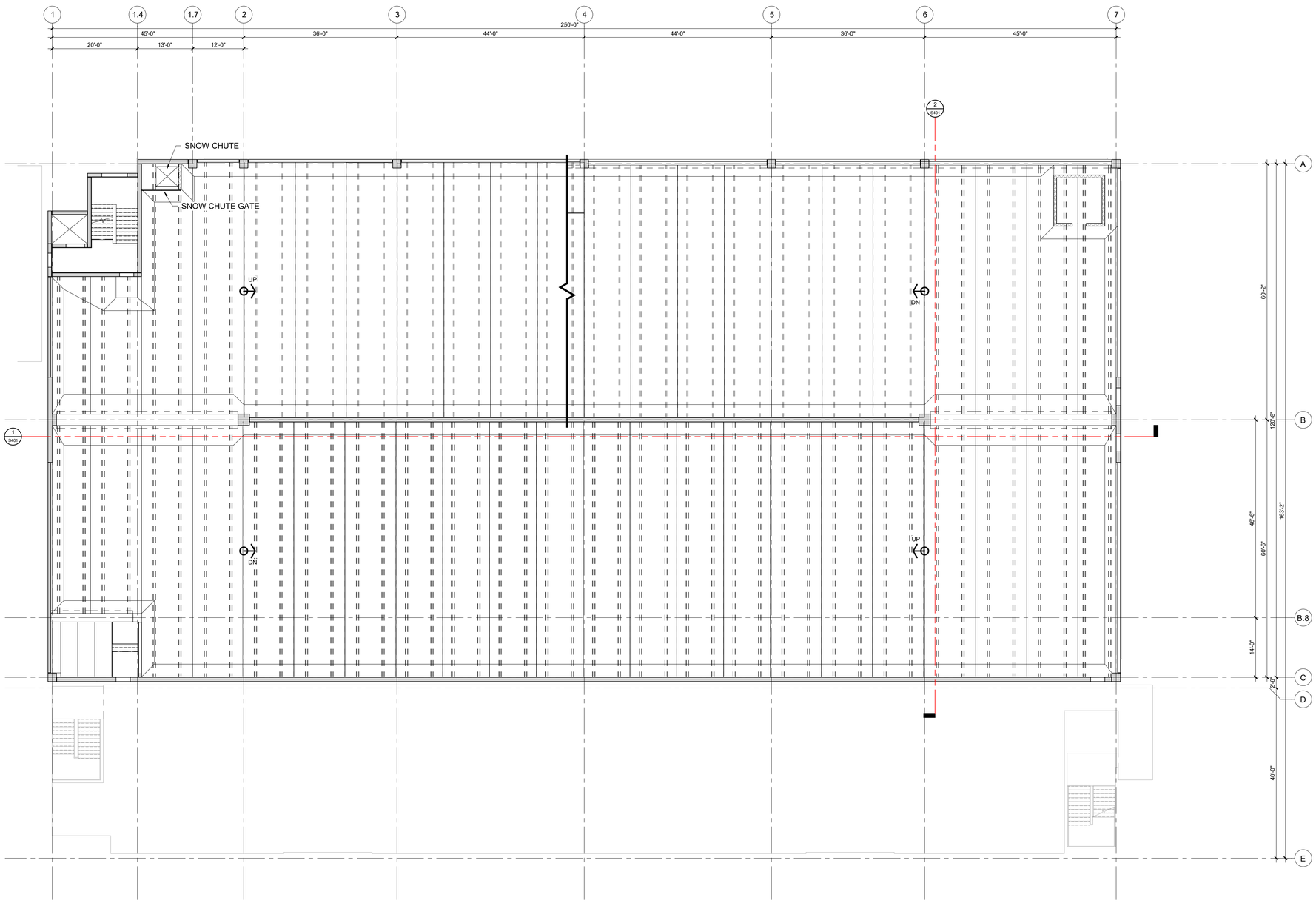
PROJECT NO.
231082

SHEET NO.

S104

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LEVEL 5 PLAN

SCALE: 3/32" = 1'-0"

NORTH

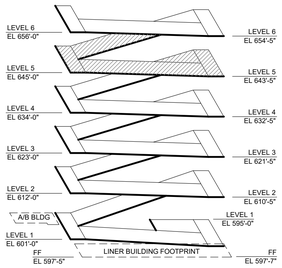
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KEY NOTES



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City of Traverse City

Traverse City, Michigan

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Drawn By	DEB
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Reviewer	JAR
Manager	JAR

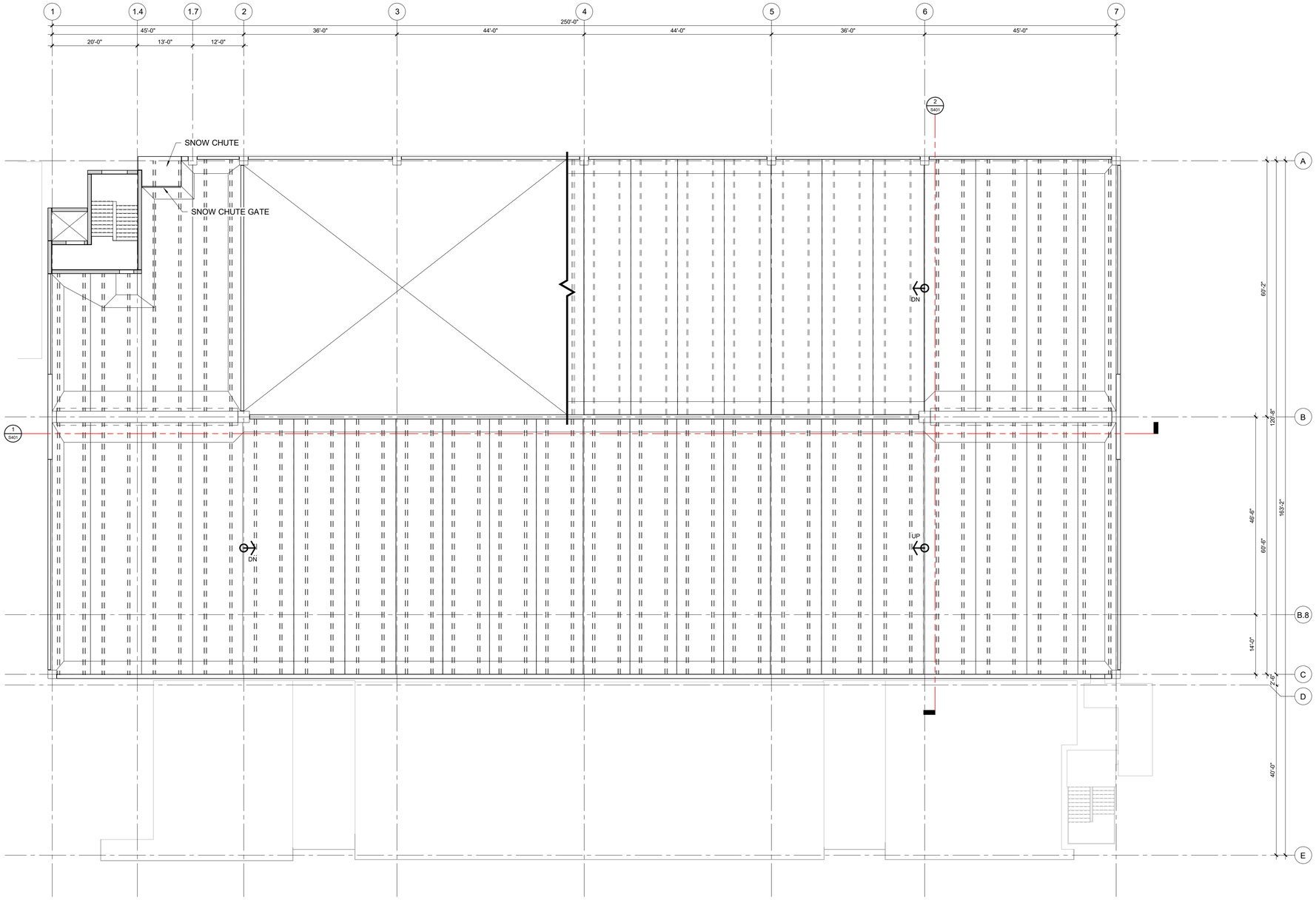
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PROJECT NO.
231082

SHEET NO.
S105

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LEVEL 6 PLAN

SCALE: 3/32" = 1'-0"

NORTH

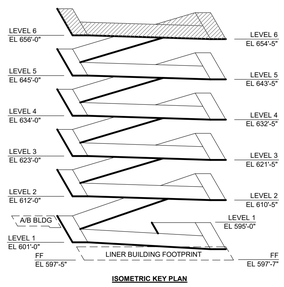
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Drawn By	DEB
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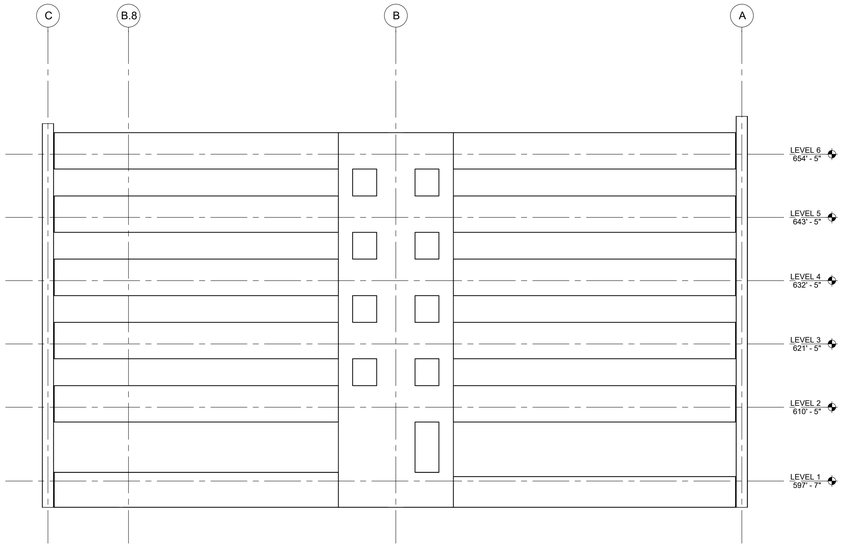
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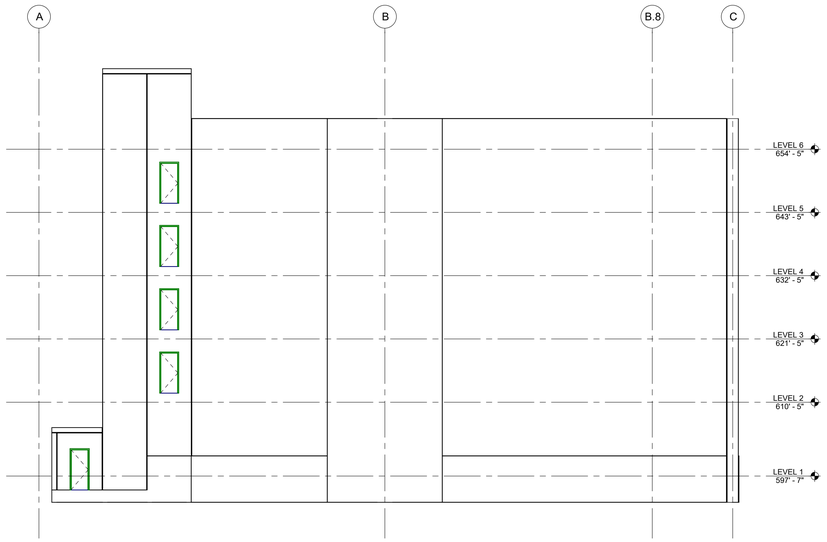
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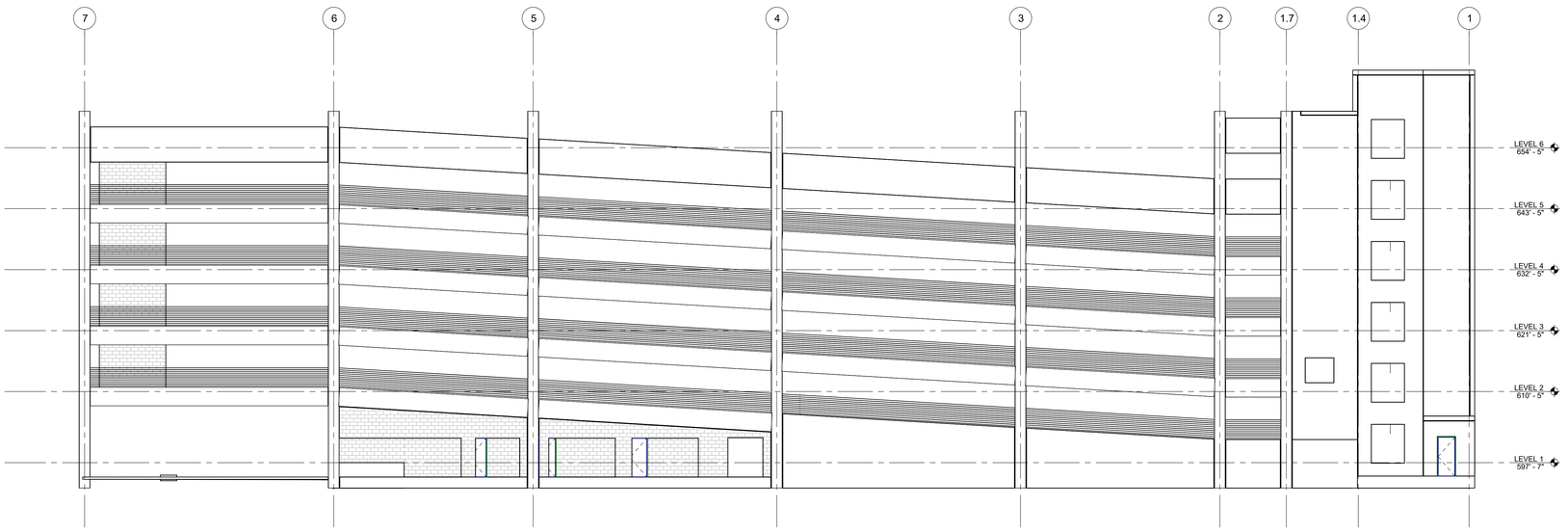
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SCALE: 3/32" = 1'-0"



4 WEST ELEVATION
SCALE: 3/32" = 1'-0"



2 SOUTH ELEVATION
SCALE: 3/32" = 1'-0"



1 NORTH ELEVATION
SCALE: 3/32" = 1'-0"

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City of Traverse City
Traverse City, Michigan

West End Mixed-Use Development

REVISIONS

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03/20/2024 100% SCHEMATIC DESIGN

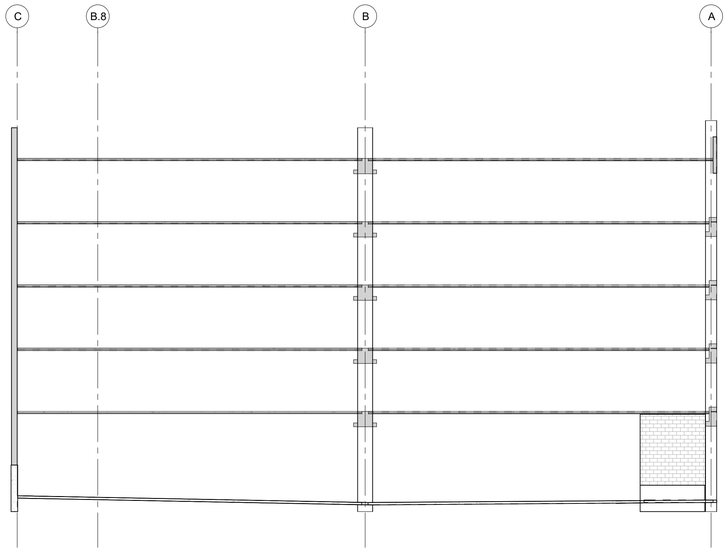
Drawn By	DEB
Designer	FGE
Reviewer	JAR
Manager	JAR

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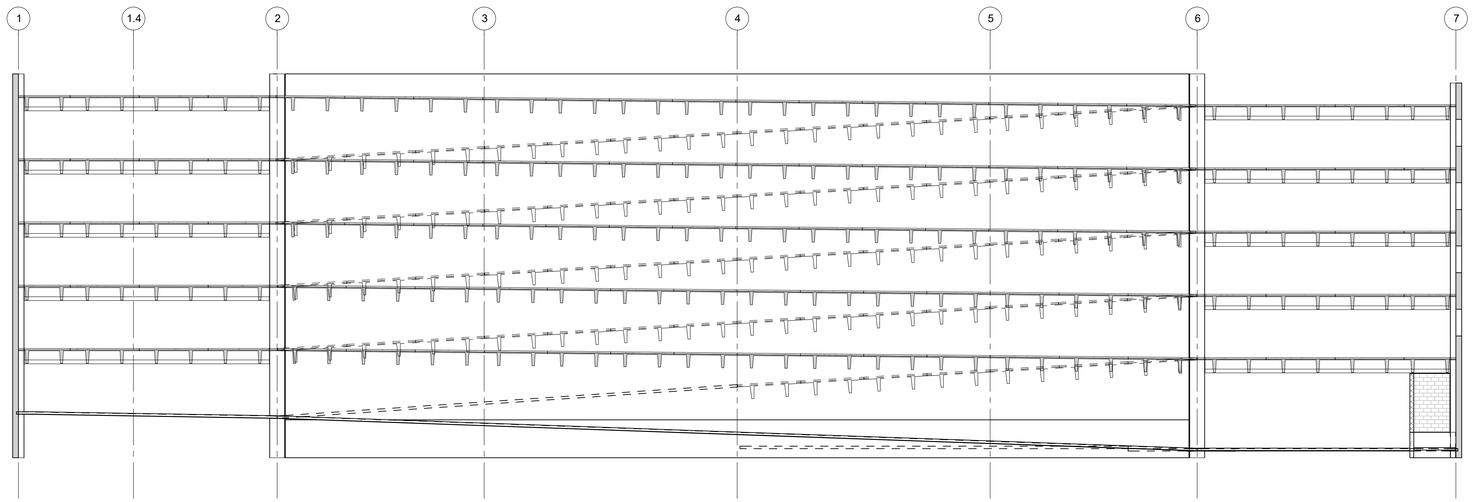
PROJECT NO.
231082

SHEET NO.
S301

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2 BUILDING SECTION - GRID 6 LOOKING WEST
SCALE: 3/32" = 1'-0"



1 BUIDING SECTION - GRID B LOOKING NORTH
SCALE: 3/32" = 1'-0"

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Traverse City, Michigan
West End Mixed-Use Development

REVISIONS

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Drawn By	DEB
Designer	FGE
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231082

SHEET NO.
S401

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Appendix 2

Geotechnical Evaluation Report

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GEOTECHNICAL EVALUATION REPORT

WEST END MIXED-USE DEVELOPMENT
TRAVERSE CITY, MICHIGAN

SME Project No. 093377.00
December 8, 2023

SME

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December 8, 2023

Mr. Joshua Rozeboom, PE
Fishbeck
4775 Campus Drive
Kalamazoo, Michigan 49008

Via E-mail: jrozeboom@fishbeck.com

RE: Geotechnical Evaluation
West End Mixed-Used Development
Traverse City, Michigan
SME Project No. 093377.00

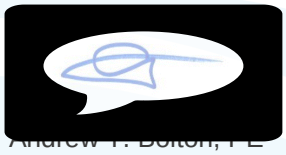
Dear Mr. Rozeboom:

We have completed our geotechnical evaluation for the proposed West End Mixed-Use Development project in Traverse City, Michigan. This report presents the results of our observations and analyses, our understanding of the project at the time this report was prepared, and our geotechnical recommendations based on the information disclosed by the borings and pressuremeter testing.

We appreciate the opportunity to be of service. If you have questions or require additional information, please contact me.

Sincerely,

SME



Andrew T. Bolton, PE
Project Manager / Senior Consultant

Enclosure: SME Geotechnical Evaluation Report; Dated December 8, 2023

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TABLE OF CONTENTS

1. INTRODUCTION 1
1.1 SITE CONDITIONS 1
1.2 PROJECT DESCRIPTION 2
2. EVALUATION PROCEDURES 2
2.1 FIELD EXPLORATION 2
2.1.1 BORINGS 2
2.1.2 PRESSUREMETER TESTING 3
2.1.3 INFILTRATION TESTING 3
2.2 LABORATORY TESTING 4
3. SUBSURFACE CONDITIONS 4
3.1 SOIL CONDITIONS 4
3.2 GROUNDWATER CONDITIONS 5
3.3 PRESSUREMETER RESULTS 5
4. ANALYSIS AND RECOMMENDATIONS 6
4.1 SITE PREPARATION AND EARTHWORK 6
4.1.1 EXISTING FILL CONSIDERATIONS 6
4.1.2 SITE SUBGRADE PREPARATION 7
4.1.3 SUBGRADE PREPARATION FOR GRADE SLABS 7
4.1.4 ENGINEERED FILL REQUIREMENTS 8
4.2 FOUNDATIONS 9
4.2.1 FOUNDATION SUBGRADE VERIFICATION 9
4.2.2 SHALLOW FOUNDATIONS 9
4.3 SEISMIC SITE CLASS 11
4.4 BELOW-GRADE WALLS AND DRAINAGE 11
4.5 DESIGN AND CONSTRUCTION CONSIDERATIONS 12
4.6 INFILTRATION TEST RESULTS 12
4.7 SULFATE TEST RESULTS 13
5. SIGNATURES 14

APPENDIX A

BORING LOCATION DIAGRAM (FIGURE NO. 1)
BORING LOG TERMINOLOGY
SME BORING LOGS (B1 THROUGH B7)
PRESSUREMETER TEST RESULTS (8 PLOTS)

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APPENDIX B

IMPORTANT INFORMATION ABOUT THIS GEOTECHNICAL-ENGINEERING REPORT

GENERAL COMMENTS

LABORATORY TESTING PROCEDURES

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1. INTRODUCTION

This report presents the results of the geotechnical evaluation performed by SME for the proposed West End Mixed-Use Development in Traverse City, Michigan. This evaluation was conducted in general accordance with the scope of services outlined in SME Proposal No. P02094.23, dated June 7, 2023 and Change Order Request No. 1 dated September 11, 2023. Fishbeck authorized our services.

To assist with the preparation of this report, Fishbeck provided SME the following documents, except where noted:

- Documents prepared for the "West End Parking Structure Design and Engineering Services" project titled "Request for Proposal" and "Addendum No. 1 and prepared by City of Traverse City.
- Drawings titled "Lot P - Landscaping / Irrigation Plan" for the "City of Traverse City 2018 Pavement Preservation Project" (Sheet No. 7 of 7) dated March 21 and November 18, 2018 and prepared by City of Traverse City.
- A drawing with a PDF filename "AEE-Dan Color-Dims" received via email on October 13, 2023 and prepared by Fishbeck.
- An AutoCAD file titled "ctopo231082" received via email on October 13, 2023 and prepared by Fishbeck.
- Two PDF files of Sheet No. C201 that indicated estimated typical footing loads, received via email on October 13, 2023 and prepared by Fishbeck.
- A drawing titled "Figure No. 4: Proposed Soil Boring and Sample Locations Map" with markups showing existing building basement locations and depths received via email from Otwell Mawby Geotechnical, P.C. Consulting Engineers (Otwell Mawby) on October 13, 2023.
- A document titled "Geotechnical Investigation Report" for the "124 West State Street" project dated April 2021 and prepared by Otwell Mawby.
- Drawing Sheets Nos. C102, C201, C401, and C501, received via email on November 1, 2023 and prepared by Fishbeck.
- Drawing Sheets Nos. A101 through A104, A11 through A113, and A200 through A202, received via email on November 1, 2023 and prepared by Fishbeck.
- Drawing Sheets Nos. AP101 through AP106, AP911, S101 through S106, S301, and S401 received via email on November 1, 2023 and prepared by Fishbeck.

1.1 SITE CONDITIONS

The project site consists of seven parcels near the intersection of Pine Street and West State Street in Traverse City, Michigan. Parcels A and B are located along the alley east of Pine Street. Parcels C through G are located east of Parcel B and have frontage along the alley and West State Street. The location of the site is depicted on the Location Map inset on the Boring Location Diagram (Figure No. 1) included in Appendix A of this report.

Existing buildings cover most of Parcels A, F, and G, and an existing building is also present on the south side of Parcel D. Per the referenced drawing titled "Figure No. 4: Proposed Soil Boring and Sample Locations Map", the majority of the existing buildings currently on-site are slab-on-grade structures, however, portions of the existing building located near the eastern end of the site contains a basement level in two areas that is between 7 and 8 feet deep. Outside of the building areas, the site generally consists of existing pavements, except for Parcel B that mostly consists of grass. Based on historic aerial imagery and the referenced As Built drawing, a building was previously located on Parcel E, but was demolished between 2017 and 2018.

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Existing site ground surface elevations vary from about 595 feet along the north site boundary to about 599 feet in the southwest portion of the site. Several underground and overhead utilities traverse the site.

1.2 PROJECT DESCRIPTION

The project will consist of the design and construction a slab-on-grade parking structure, and two, slab-on-grade mixed use buildings. The proposed parking structure will be located on the northern portion of Parcels C through G and will cover a footprint of about 123 feet by 252 feet. The proposed Liner Mixed-Use Building will abut the south side of the proposed parking structure and will be a 5-story structure covering a footprint of about 41 feet by 261 feet. The proposed A-B Mixed-Use Building will extend west of proposed parking structure on Parcels A and B and will be a 5-story structure covering a nominal footprint of about 48 feet by 93 feet. The proposed structures are illustrated on Figure No. 1.

The proposed parking structure will have maximum column and wall loads (dead load plus live load) of about 1,090 kips and about 43 kips per foot, respectively. The proposed Liner Building will have maximum column and wall loads (dead load plus live load) of about 450 kips and about 26 kips per foot, respectively. The proposed A-B Building will have maximum column and wall loads (dead load plus live load) of about 360 kips and about 26 kips per foot, respectively.

Based on the referenced documents, we anticipate Level 1 finish floor elevations (FFEs) will be about 597.5 feet for the proposed Liner and A-B Buildings and vary between about 597.5 and 601 feet for the proposed parking structure. Therefore, we anticipate fills of 4 feet or less will be required to establish the Level 1 FFEs.

The project will also include a below-grade infiltration basin beneath the parking structure. We anticipate the bottom of the basin will be situated about 5 to 6 feet below the parking structure grade-slab.

The existing buildings on the site will be demolished prior to construction. We understand environmental remediation on Parcels A and B will include excavation and removal of the soil on Parcel A and approximately the western half of Parcel B. We understand the excavation for environmental remediation in this area could extend to groundwater, approximately 14 feet beneath existing site grades. However, the specific excavation depth has not yet been determined. In addition, as discussed above, portions of the existing buildings on Parcels F and G include basements that extend about 7 to 8 feet beneath existing site grades. The excavation for environmental remediation, and the existing basements, along with depressions resulting from the demolition of the remaining slab-on-grade buildings will be backfilled with engineered fill to establish final site grades.

An Earth Retention System (ERS) is necessary along the north, south, and west sides of the environmental remediation areas on Parcels A and B to allow for the proposed excavation. Consideration should be given to designing the ERS so that it can utilized for both the environmental remediation excavation and construction of the proposed structures. SME can assist with ERS design, if requested.

2. EVALUATION PROCEDURES

2.1 FIELD EXPLORATION

2.1.1 BORINGS

SME performed seven borings (B1 through B7) at the site on September 11 through September 14, 2023. Each boring extended 60 feet beneath the existing ground surface. The approximate as-drilled locations of the borings are depicted on Figure No. 1.

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Prior to performing the borings, SME retained a subcontractor to perform ground penetrating radar (GPR) scanning around an approximate 10-foot by 10-foot area around each boring.

SME determined the planned location, number, and depth of the borings. SME located the borings in the field by refencing existing site features. SME estimated the existing ground surface elevations at the borings to the nearest 1-foot based on the referenced AutoCAD file.

The borings were drilled using a rotary drill rig and were advanced to the sampling depths using continuous-flight augers and wash rotary drilling methods. The borings included soil sampling based upon the Split-barrel Sampling Procedure. Recovered split-barrel samples were sealed in glass jars by the driller.

Groundwater measurements were obtained during drilling. After drilling, the boreholes were backfilled with auger cuttings and bentonite chips. Backfill of the boreholes in existing pavement areas included Epco Hole Plugs and were topped with quick-setting concrete mix.

2.1.2 PRESSUREMETER TESTING

SME performed eight in-situ pressuremeter tests on September 18 and September 19, 2023. The pressuremeter tests were performed adjacent to borings B2 and B6 at test depths ranging from about 4 to 45 feet below the existing ground surface. Pressuremeter tests were performed to obtain limit pressures and soil moduli of the tested soils, to more accurately evaluate the bearing capacity that can be achieved and estimate the associated settlement of the soil.

The pressuremeter testing models the static loading characteristics of a typical spread foundation and is considered more accurate than conventional dynamic test methods such as the Standard Penetration Test (SPT), which requires empirical correlations to develop strength parameters unlike the pressuremeter test, which directly measures strength and compressibility.

In the pressuremeter test, a radial expandable cylinder probe was inserted at the selected testing depth into a borehole that was carefully prepared using wash rotary drilling methods. Borehole preparation for this project consisted of first driving a typical SPT sampler at the proposed test depth, and then driving an oversized split-barrel sampler at the same test depth to provide the diameter required to insert the pressuremeter probe. The probe was inserted in the borehole to the sampling depth and then it was expanded against the sides of the borehole utilizing hydraulic pressure obtained from a screw jack located within the pressuremeter console at the ground surface. The pressuremeter console permits simultaneous measurement of pressure and volume change within the probe. The pressure was incrementally increased until either the maximum probe volume was reached or until the onset of failure of the soil at the test depth, whichever was first.

The pressuremeter data was reduced to yield a graphical representation of the stress-volume relationship of the soil at the test depth. Based on the stress-volume curves, and the strength and compressibility characteristics of the tested soil strata were estimated. These characteristics include soil yield pressure (P_f), soil limit pressure (P_l), and the Pressuremeter Moduli (E_p). The results of the pressuremeter tests are summarized in Section 3.3.

2.1.3 INFILTRATION TESTING

SME performed two in-situ infiltration tests (B2A and B6A) on September 18 and September 19, 2023, adjacent to boring locations B2 and B6. SME located the infiltration test location based on measuring from the staked borings, and we estimated the existing ground surface information to the nearest 1-foot based on the referenced AutoCAD file.

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The boreholes to perform the infiltration tests were created by advancing hollow-stem augers with the drill rig to reach the test depth. The depth for each infiltration test is shown on Table 2 (included in Section 4.6). After the boreholes were advanced to achieve the infiltration test depth, the augers were extracted and a 6-inch-diameter PVC outer casing (standpipe) and a 4-inch-diameter inner casing (standpipe) were inserted into the borehole. The casings were seated about 2 inches into the subgrade at the bottom of the prepared borehole. About 2 inches of washed peastone was added inside the casings to prevent subgrade disturbance when adding water to the standpipes.

The infiltration tests generally followed the double-ring infiltrometer field test procedures outlined in Appendix E in the Low Impact Development (LID) Manual for Michigan (dated 2008) prepared by the Southeast Michigan Council of Governments (SEMCOG). To conduct the infiltration test, the test soil was pre-soaked by filling both standpipes with about 12 inches of water. The water was observed to drain (i.e., drop) within the inner standpipe at a rate of greater than 2 inches per 30 minutes during the pre-soaking period. After pre-soaking, the standpipes were filled with about 12 inches of water above the bottom or test elevation, and then the water level drop in the inner standpipe was recorded at timed intervals of 10 minutes. This procedure was repeated until four consecutive water level changes (i.e., distance the water dropped over the prescribed time interval) were recorded to be within a 1/4-inch of one another. The water level drop recorded within the inner standpipe during the final time interval was used to calculate the infiltration rate at the test location. After completion of the infiltration test, the standpipes were removed. The boreholes used to conduct the infiltration tests were backfilled with auger cuttings, and the surface was topped with quick-setting concrete mix.

2.2 LABORATORY TESTING

The laboratory testing program consisted of performing visual soil classification on recovered samples in accordance with ASTM D-2488. The Laboratory Testing Procedures in Appendix B provides descriptions of the laboratory tests performed. SME also performed three soluble sulfate tests on select soil samples. Based on the laboratory testing, we developed a soil description and assigned a Unified Soil Classification System (USCS) group symbol to each of the various soil strata encountered.

Upon completion of the laboratory testing, SME prepared boring logs which include information on materials encountered, penetration resistances, pertinent field observations made during the drilling operations, the results of the laboratory tests (excluding the soluble sulfate tests), and existing ground surface elevations as estimated by SME. The boring logs are included in Appendix A. Explanations of symbols and terms used on the boring logs are provided on the Boring Log Terminology sheet included in Appendix A.

Soil samples are normally retained in our laboratory for 60 days and are then disposed of, unless instructed otherwise.

3. SUBSURFACE CONDITIONS

3.1 SOIL CONDITIONS

The soil conditions generally consisted of surficial materials (i.e. topsoil or pavements) overlying existing sand fill underlain by natural sands that extended to the explored depth of the borings. However:

- Existing sand fill was not encountered at boring B1.
- Interbedded strata and/or layers of natural clayey silts and/or clays were encountered within the natural sands at each boring between about 48.5 and 58.5 feet beneath the existing ground surface.

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The existing sand fill extended to about 1.5 to 6 feet beneath the existing ground surface, corresponding to approximate elevations 591 to 596 feet. The existing sand fill was encountered in a very loose to medium dense condition. The existing sand fill encountered at boring B5 contained frequent brick fragments.

The natural sands were encountered in a loose to extremely dense condition.

The soil profile described above and included on the boring logs is a generalized description of the conditions encountered. The stratification depths described above and shown on the boring logs indicate a zone of transition from one soil type to another. They do not show exact depths of change from one soil type to another. Soil conditions may vary between or away from the boring locations. Please refer to the boring logs for the soil descriptions and results of field and laboratory tests at the specific boring locations.

Thickness measurements of surficial materials, e.g., topsoil and pavements, reported on the boring logs should be considered approximate since mixing of the topsoil with the underlying subgrade can occur while advancing the augers, and it is difficult to measure the thickness of surface materials in small-diameter boreholes. Shallow hand augers or test pits should be performed in topsoil areas and pavement cores in pavement areas if more accurate thicknesses of surficial materials are required.

It is sometimes difficult to distinguish between fill and natural soils based on samples and cuttings from small-diameter boreholes. Therefore, the delineation of fill described above and on the boring logs should be considered approximate only.

3.2 GROUNDWATER CONDITIONS

Groundwater was encountered at the borings about 14 to 18.5 feet beneath the existing ground surface during drilling, corresponding to approximate elevations 578.5 to 582 feet. Due to the use of wash rotary drilling methods, groundwater measurements were not obtained upon completion of drilling. Based on the relatively permeable nature of the site sands, we judge the groundwater levels encountered to be indicative of the site groundwater levels at the time of drilling.

Groundwater levels, perched groundwater conditions, and the rate of infiltration into excavations should be expected to fluctuate throughout the year, based on variations in precipitation, evaporation, run-off, the water levels of the Boardman River and Grand Traverse Bay, and other factors. The groundwater levels indicated by the borings represent conditions at the time the readings were taken. The actual groundwater levels at the time of construction may vary from those conditions noted on the boring logs. Refer to the individual boring logs for specific information.

3.3 PRESSUREMETER RESULTS

The results of the pressuremeter tests are summarized in Table 1 below. The results were obtained by reducing the pressuremeter test data obtained during the field exploration, which is summarized on the graphical plots of stress-volume change developed for each test location and depth. These graphs are presented in Appendix A of this report.

The results include the Yield Pressure (P_f), Limit Pressure (P_l), and Pressuremeter Modulus (E_p) at each location and test depth. The yield and limit pressures represent the stresses at which plastic deformation begins and at which soil failure occurs, respectively, and can be used as input into equations that estimate allowable foundation bearing pressures. The pressuremeter modulus represents the stress-strain relationship of the soils tested and can be utilized as input into equations to estimate settlement of the soils under a given static stress (i.e., bearing load) below the yield pressure.

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TABLE 1: PRESSUREMETER TEST DATA

BORING LOCATION	TEST DEPTH (FEET)	USCS SOIL CLASSIFICATION	N_{60}-VALUE (BPF)	P_f (TSF[1])	P_l (TSF[1])	E_p (TSF[1])
Adjacent to B2	6 to 8	Fine to Medium SAND (SP)	11	6.3	10	92
Adjacent to B2	13 to 15	Fine to Medium SAND (SP)	28	13.2	NA[2]	112
Adjacent to B2	28 to 30	Fine to Medium SAND with Silt (SP-SM)	52	17.6	NA[2]	167
Adjacent to B2	43 to 45	Fine to Medium SAND (SP)	40	17.6	30	206
Adjacent to B6	4 to 6	Fine to Medium SAND (SP)	20	7.1	12	114
Adjacent to B6	13 to 15	Fine to Medium SAND (SP)	23	8.3	18	143
Adjacent to B6	23 to 25	Fine to Medium SAND (SP)	53	17	30	177
Adjacent to B6	38 to 40	Fine to Medium SAND (SP)	65	17.3	NA[2]	210

NOTES:
1. Units presented in tons per square foot (tsf).
2. Pressure could not be determined from the field data.

4. ANALYSIS AND RECOMMENDATIONS

4.1 SITE PREPARATION AND EARTHWORK

4.1.1 EXISTING FILL CONSIDERATIONS

We consider the existing fill to be undocumented because we are not aware of records that document fill placement and compaction operations. Based on the variability of the existing fill, at least portions of the fill were likely not placed and compacted as engineered fill. Therefore, the existing fill is considered uncontrolled. Based on the condition of the fill encountered in the borings, the existing fill is not suitable for support of the foundations for the proposed buildings, but is generally considered suitable for support of slabs-on-grade and pavements provided the subgrade soils are evaluated and prepared, as described below, prior to construction, and the Owner accepts the risks of poor structural performance of the slabs and pavements discussed below.

There are inherent risks of greater than typical settlement and poor performance associated with constructing floor slabs and pavements over undocumented or uncontrolled fills. These risks can be eliminated by removing the fill beneath these proposed improvements and replacing the fill with engineered fill. This approach will result in additional construction costs compared to leaving at least portions of the existing fill in-place below floor slabs and pavements.

If the Owner can accept risks related to leaving the existing fill in-place, we believe it is feasible to construct the proposed floor slabs and pavements over the existing fill, which would result in significant construction cost savings compared to removal or improvement of the existing fill. The risks associated with leaving the existing fill in-place can be significantly reduced, but not completely eliminated, by thoroughly evaluating the condition of the fill during construction, remediating unsuitable fill materials that

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are identified, and improving the subgrade as recommended in the following report sections. We believe the risks of poor structural performance associated with constructing floor slabs and pavements over the existing fill at this site could include a risk of differential settlements and the associated cracking of floor slabs at-grade and pavements.

The recommendations provided in the following report sections are based on the assumption that the existing fill will not be used for support of foundations, and the assumption that the Owner is willing to accept the increased risks described above associated with floor slabs and pavements, and that the existing fill will generally remain in-place and used for support of floor slabs and pavements, except in cases where unsuitable fill materials are undercut and removed. If the Owner is not willing to accept this increased risk, we recommend the existing fill be completely removed beneath the entire building footprints and replacement with engineered fill.

4.1.2 SITE SUBGRADE PREPARATION

Existing below-grade structures, including walls, slabs, foundations, etc., associated with the previous site development should be completely removed from within proposed structure areas. These areas where existing structures are removed should be backfilled with engineered fill to the design subgrade level. Existing utilities within the proposed building footprints should be rerouted around the structures. Abandoned utilities should be removed and backfilled with granular engineered fill to the design subgrade level.

The proposed building and pavements areas, and areas to receive engineered fill, should be cleared of existing topsoil, pavements, trees, root mats, unsuitable fill, and other deleterious materials to expose the underlying inorganic subgrade soils. We recommend the clearing and stripping extend a minimum of 5 feet beyond these areas.

After clearing, and after cutting to design subgrade levels but before placing engineered fill, we recommend the exposed subgrade be uniformly compacted within a vibratory, smooth-drum roller. After compaction, the exposed subgrade should be subjected to a comprehensive proofrolling program in the presence of SME. The purpose of proofrolling is to locate areas of unsuitably loose or yielding subgrade. Proofrolling should be performed with a fully-loaded, tandem-axle dump truck or other pneumatic-tire construction equipment. Areas of unsuitable (i.e., loose or yielding) subgrade revealed during proofrolling should be mechanically improved (compacted) in-place or removed and replaced with engineered fill. In areas that are not accessible to proofrolling equipment, we recommend the exposed subgrade be evaluated by SME with hand-operated equipment such as dynamic cone penetrometers and hand augers.

After the exposed subgrade is proofrolled and improved as necessary, engineered fill may be placed on the exposed subgrade to establish final subgrade levels. Section 4.1.4 of this report presents materials and compaction requirements for engineered fill.

4.1.3 SUBGRADE PREPARATION FOR GRADE SLABS

Suitable grade-slab subgrade for this project consists of existing sand fill or natural sands that have been suitably compacted and are in an undisturbed condition, or engineered fill placed directly over the materials described above. The grade slab subgrades must be evaluated and prepared as described in Sections 4.1.1 and 4.1.2 and below.

Prior to concrete placement for floor slabs, the floor-slab subgrade should be observed and tested to verify subgrade conditions are suitable for floor slab support. The evaluation of the subgrade should consist of density testing or the use of appropriate hand-operated equipment, such as hand augers and cone penetrometers. Unsuitable subgrade indicated by SME should be recompacted.

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Provided the underlying subgrade is properly prepared, we recommend a modulus of subgrade reaction k (30) of 150 kcf can be used for the grade-slab design. The recommend subgrade modulus k (30) is based on correlations with soil type developed from plate load tests conducted using a 30-inch diameter plate with 0.05-inches of deflection.

We recommend a slab subbase consisting of a minimum 6 inches of an approved granular material. The purpose of this is to provide a leveling surface for construction of the building floor slab and a moisture capillary break between the slabs and the underlying soils. We recommend MDOT Class II granular material be used for this purpose. **This granular layer should be increased to 12 inches for improved protection and resistance to frost related movements in the parking structure, which will be unheated.** MDOT 21AA dense-graded aggregate may be used in lieu of the MDOT Class II granular material for improved stability and greater resistance to disturbance due to construction traffic. However, a thicker layer of aggregate may be needed to provide a stable construction platform, depending on the condition of subgrade soils during construction and the type of construction equipment to traffic the prepared subgrade. The granular materials or aggregate should be compacted per the "Engineered Fill Requirements" section of this report (Section 4.1.4). We do not recommend relying on the leveling course to protect the underlying subgrade from disturbances. Therefore, place the concrete slab soon after the leveling course to minimize subgrade disturbance.

We recommend a vapor retarder be provided below areas of floor slab that will receive an impermeable floor finish/seal or a floor covering which would act as a vapor barrier. The location of the vapor retarder (relative to the subbase) should be determined by the Architect/Engineer based on the intended floor usage, planned finishes, and in accordance with ACI recommendations.

Slabs should be separated by isolation joints from structural walls and columns bearing on spread foundations to permit relative movement. We recommend a minimum of 6 inches of engineered fill between the bottom of the slab and the top of the shallow foundation below.

We recommend the slab-on-grade subgrade soils be protected from frost action during winter construction. Frozen soils must be thawed and compacted or removed and replaced prior to slab-on-grade construction.

4.1.4 ENGINEERED FILL REQUIREMENTS

Fill placed within the construction area, including utility trench backfill, should be an approved material, free of frozen soil, organics, cobbles, boulders, construction debris, particle sizes that will hinder compaction, or other deleterious materials. The fill should be spread in level layers not exceeding 9 inches in loose thickness and be compacted to a minimum of 95 percent of the maximum dry density as determined in accordance with the Modified Proctor test. Sand fill should be compacted with a 20-ton smooth-drum vibratory roller or vibratory plate compactor mounted on a backhoe or excavator (hoe-pac).

We believe the natural sands and most of the existing sand fill encountered at the site are suitable for reuse as engineered fill below proposed pavement and grade slab areas, provided the soils meet the requirements listed in the previous paragraph. Water (e.g., via water trucks) may need to be added to sand to allow for proper compaction. We do not recommend the use of imported clay fill. We recommend imported engineered fill materials meet the requirements for MDOT Class II granular material.

As discussed in Section 4.2, SME recommends supporting the proposed structures on shallow foundations bearing on either natural sands or on engineered fill overlying natural sands. Therefore, portions of the proposed structures will be supported on shallow foundations that bear on engineered fill used to backfill the excavation on the west side of the site and the existing basement areas on the east side of the site. Where engineered fill will support proposed footings, we recommend imported fill consisting of MDOT Class II granular material be used as engineered fill. We recommend MDOT Class II granular material is used to backfill below proposed foundations, including the horizontal offsets illustrated in Image No. 1 below.

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Assuming the excavation on the west side of the site extends to groundwater, coarse crushed aggregate consisting of a well graded crushed natural aggregate or crushed concrete ranging from 1 to 3 inches in size with no more than 7 percent by weight passing the No. 200 sieve should be placed to a minimum of 1-foot above the groundwater level. The coarse crushed aggregate should be compacted until stable. The surface of the coarse crushed material must be covered with a suitable non-woven geotextile, to prevent migration of the sand fill placed above the coarser crushed aggregate. The coarse crushed material can also be used to stabilize subgrades in other areas of the site, if required.

4.2 FOUNDATIONS

4.2.1 FOUNDATION SUBGRADE VERIFICATION

To verify the foundation subgrade exposed at the foundation bearing surfaces is suitable for the recommended maximum net allowable soil bearing pressure, and to verify any necessary improvements at or below the foundation subgrade have been suitably performed, the final foundation subgrades must be evaluated and tested by SME during construction. By performing the geotechnical evaluation for this project, and preparing this geotechnical evaluation report, SME is the geotechnical engineer of record for this project and is best suited to verify the recommendations of this report, and the design requirements of this project, are in fact incorporated into the construction.

Evaluation of the bearing soils by SME is necessary to confirm the recommendations of this report, particularly for this project, since the recommended bearing pressure for the proposed additions was confirmed by pressuremeter testing performed by SME and not by typical SPT testing.

Based on the field exploration, which included borings and pressuremeter testing, and considering the foundation loads for the proposed structures, SME recommends a higher than typical bearing pressure for design of shallow foundations at this site. On that basis, it is imperative that SME be retained to observe and test the placement and compaction of engineered fill at this site that will support foundations. In addition, SME should be retained to perform pressuremeter testing on the engineered fill after placement and compaction to verify it is suitable for the recommended design bearing pressure.

4.2.2 SHALLOW FOUNDATIONS

Shallow spread foundations, bearing on suitable natural sands, or on engineered fill placed over suitable natural sands, are recommended for support of the proposed structures. Based on the soil conditions encountered at the borings performed for this evaluation and the in-situ pressuremeter tests, the proposed structures may be supported on shallow foundations. We recommend shallow foundations for the proposed structures be designed for maximum net allowable soil bearing pressures of 8,000 psf. The design maximum net allowable soil bearing pressure is based on a global safety factor of three or more (for general shear failure). Suitable bearing soils were encountered at the borings below the surficial topsoil and existing sand fill beginning about 1 to 7 feet beneath the existing ground surface at the building borings, corresponding to approximate elevations 591 to 596 feet.

It is important to note that granular soils, particularly when disturbed during excavation activities or from construction traffic, may not be sufficiently dense for the above recommended design bearing pressure. Also, the in-situ relative density of the natural sands was found to be variable and it will be important to compact the footing subgrade (in a uniform manner) to limit differential settlement between neighboring foundations. As a result, we recommend each footing subgrade be thoroughly compacted in-place with either a 20-ton smooth-drum vibratory roller or vibratory plate compactor mounted on a backhoe or excavator (hoe-pac) prior to placing foundation concrete. Water may need to be added to allow for suitable compaction.

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Existing fill and unsuitably loose natural sands that cannot be improved in-place, need to be undercut to expose suitable natural sands. In undercut areas, foundations could be constructed at bottom of the undercut where suitable subgrade is encountered. Alternatively, foundations could be constructed at normal footing levels on engineered fill or crushed aggregate placed as backfill in the undercut excavation. For this option, the undercut to remove unsuitable soils needs to extend laterally on a two vertical to one horizontal slope from the edge of the footing. Please refer to the following Typical Foundation Undercutting Diagram (Image No. 1):

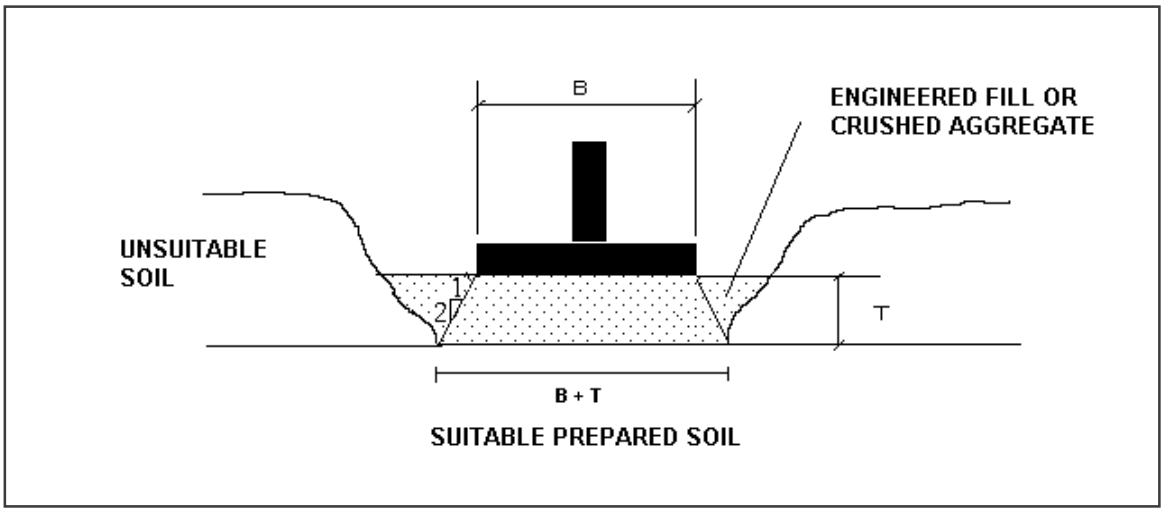


IMAGE NO. 1: Typical Foundation Undercutting Diagram

For bearing capacity and settlement considerations, we recommend continuous (wall) footings have a minimum width of 24 inches and spread (column) footings have a minimum dimension of 36 inches. In some cases, the minimum footing size criteria may govern the size of the foundation and not the allowable soil bearing pressure.

Foundations must be situated a minimum of 42 inches below final site grades along exterior walls or in unheated areas for protection against frost action during normal winters. Interior foundations in heated areas of the building may be constructed at shallower levels if the foundations bear on suitable natural sands. However, the foundations and proposed bearing soils must be protected from freezing during construction if work occurs in the winter months. In addition, caved soils must be suitably removed from the foundation bearing surfaces before placing concrete.

The natural sands and existing sand fill encountered at the site are subject to sloughing and caving, and earth-formed foundations constructed within the sands (neat trench methods) are not considered feasible for this project. Rather, we anticipate the foundations will need to be formed using man-made forms. Vertical excavation sidewalls must be maintained during foundation concrete placement.

We estimate total settlement for spread foundations using the recommended maximum net allowable bearing pressures and bearing on suitable soils as described above and as verified in the field at the time of construction by SME should be 1 inch or less. Differential settlements are estimated to be about one-half the total settlement. The differential settlements presented above are based on column foundations with similar loads bearing on similar materials. Higher differential settlements that approach the total settlement value could result from adjacent foundations with significantly different structural loading conditions. The settlement estimates provided are based on the available boring information, pressuremeter tests, the foundation loads described in Section 1.2, our experience with similar structures and soil conditions, and field verification of suitable bearing soils by SME.

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The passive resistance of the soil adjacent to the foundations may be used to resist horizontal loads. Using a free draining granular backfill meeting MDOT Class II granular material requirements, an allowable equivalent fluid passive pressure of 180 pcf is recommended for design. The use of the allowable passive equivalent fluid pressure requires a horizontal soil mass extending at least three times the height of the surface, generating the passive pressure, and the use of granular engineered fill to backfill around the perimeter of the shallow foundations after concrete placement. Sliding resistance along the base of foundations may also be used to resist horizontal loads. We recommend an ultimate coefficient of sliding friction of 0.40 for foundation design for foundations bearing on suitable natural sands or granular engineered fill. We do not recommend adhesion be included when evaluating sliding resistance along the base of foundations as sand is anticipated to be encountered at the foundation subgrade.

4.3 SEISMIC SITE CLASS

According to the information obtained from the borings, and on our general experience in the project area, the subgrade soils at this site can at least be designated as seismic site Class D in determining seismic design forces for this project in accordance with the 2015 Michigan Building Code (MBC) referencing Table 20.3-1 in ASCE Standard ASCE/SEI 7-10. However, Section 1613.3.1 of the 2015 Michigan Building Code (MBC) states, "The parameters S_s and S_1 shall be determined from the 0.2 and 1-second spectral response accelerations shown on Figures 1613.3.1(1) through 1613.3.1(8). Where S_1 is less than or equal to 0.04g and S_S is less than or equal to 0.15g, the structure is permitted to be assigned to Seismic Design Category A."

For this site location, the mapped short-period spectral response acceleration, S_S, and mapped spectral response acceleration at 1-second period, S_1, is 0.05g (less than or equal to 0.15g) and 0.033g (less than or equal to 0.04g), respectively. Therefore, a seismic Site Class does not need to be provided for this site and a Seismic Design Category A structure can be designed for this project according to the 2015 MBC note above.

4.4 BELOW-GRADE WALLS AND DRAINAGE

The proposed buildings will include interior elevator pits. Based on experience, we assume the elevation pits will extend about 5 to 6 feet beneath the building FFE, however, SME has not been provided the bottom elevation for the elevator pits.

Below-grade walls must be backfilled with relatively well-draining MDOT Class II granular material that is compacted to a minimum of 95 percent of the maximum dry density as determined by the modified Proctor test. Care should be exercised during compaction of the wall backfill to avoid overstressing the walls. If required, walls must be designed to accommodate the additional stresses associated with operating compaction equipment adjacent to the wall.

For a drained granular backfill and a level finished surface behind the below-grade wall, an active equivalent fluid pressure of 40 pcf should be used for the design of flexible walls. This earth pressure is based on the walls being flexible enough to permit the active earth pressure condition to be reached. An inward movement equal to approximately 0.001 times the height of the wall is generally required to achieve the active earth pressure condition for granular backfill. If the wall is restrained or is rigid enough so that it does not rotate sufficiently to reach the active condition, a higher (at-rest) lateral earth pressure should be used for design. For rigid walls backfilled with a well-draining granular material and a level finish surface behind the below-grade wall, we recommend an at-rest equivalent fluid pressure of 55 pcf be used for design.

Additional lateral pressures due to surcharge loading, such as adjacent floor or column loads, stored materials, or traffic loads, should be added to the above lateral earth pressures for design. We recommend using horizontal coefficients of 0.33 and 0.5, for active and at-rest conditions respectively, to calculate loads on walls due to surcharges. Use of these values requires a granular wall backfill. Surcharge loads should be modeled as a uniform pressure distribution applied to the entire wall height.

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The earth pressures presented above are for a drained backfill. Based on the lack of groundwater encountered at the borings and due to the permeable nature of the site sands, we do not believe it is necessary to install permanent drains along the base of the below-grade elevator pits. However, we recommend water stops be used at joints in the concrete and a damp-proofing compound be used on below-grade walls.

4.5 DESIGN AND CONSTRUCTION CONSIDERATIONS

Based on the groundwater levels encountered during drilling, groundwater seepage into excavations that do not extend below approximate elevation 582 feet are not anticipated. However, groundwater seepage from perched groundwater or runoff could be encountered above elevation 582 feet. Where encountered, we anticipate standard sump pit and pumping procedures will be adequate to control these accumulations, on a localized basis. High-capacity dewatering techniques will be required to control seepage into excavations that extend below the groundwater level. A working surface of crushed aggregate or crushed concrete will be required to protect the exposed subgrade where water is present.

The contractor must protect adjacent existing buildings, utilities, and roadways during construction of the proposed structures and site improvements. Pre-existing condition surveys should be considered to document conditions of nearby structures prior to performing the work. During the excavating and compacting operations, vibrations must be monitored as needed to verify they do not exceed threshold limits that could cause damage and settlement of the existing nearby buildings, utilities and roadways. The contractor must provide adequate sloping and/or shoring to avoid excavations undermining existing utilities, and/or roadways. Contact SME for more information about performing condition surveys or vibration monitoring during construction.

Where sufficient space or setback from existing structures, utilities or roadways exists, we anticipate the sides of the excavation can be temporarily sloped back in accordance with applicable regulations. However, in areas where sufficient setback cannot be maintained, an ERS will be required during construction.

The contractor must provide a safely sloped excavation or an adequately constructed and braced shoring system in accordance with federal, state, and local safety regulations for individuals working in an excavation that may expose them to the danger of moving ground. If material is stored or heavy equipment is operated near an excavation, use appropriate shoring to resist the extra pressure due to the superimposed loads.

Handling, transportation, and disposal of excavated materials and groundwater should be performed in accordance with applicable regulatory requirements.

4.6 INFILTRATION TEST RESULTS

Table 2 below summarizes the location, depth, elevation, and results of the infiltration tests. Table 2 also includes the USCS Group Symbol based on our visual classification of the soils present at the infiltration test depths based on the conditions encountered in the adjacent borings.

TABLE 2: DOUBLE-RING INFILTROMETER FIELD TEST DATA

INFILTRATION TEST LOCATION	TEST DEPTH (FEET)	TEST ELEVATION (FEET +/-)	LOCATION FROM ADJACENT BORING	USCS GROUP SYMBOL[1]	INFILTRATION RATE (IN/HR)[2]
B2A	6	590	6 feet northwest	SP	38
B6A	6.5	591.5	6 feet west	SP	43

NOTES:

1. Unified Soil Classification System (USCS) designation of soil encountered at the test depths in the boring adjacent to the test location.
2. Infiltration rate is provided in units of inches per hour (in/hr.).

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The infiltration rates reported in Table 2 should be considered the maximum rates for the tested soil at the tested depth/elevation, under the initial head of 12 inches for the infiltration test. The infiltration rate is the measured infiltration rate and does not include a reduction factor. Variations in soil and groundwater conditions, along with a variety of other factors, can result in different infiltration rates away from the boring/test locations.

Based on the borings and the infiltration test results, infiltration rates should be expected to be relatively high in the "clean" site sands (with USCS Group Symbol "SP") a suitable distance above the groundwater table. Infiltration rates will be significantly reduced in the sands with higher silt contents (USCS Group Symbols "SP-SM" and "SM"). Clays and silts are not suitable for infiltration purposes.

Where infiltration is considered in the design of the stormwater management systems, an engineered stormwater management system would be required. The engineered system would likely encompass a defined area that consists of several feet of well-draining granular soils, suitable distance above the groundwater table (e.g., freeboard), and a subsurface drainage outlet.

The engineered system will need to be designed by a professional civil engineer registered in the State of Michigan. We recommend an SME representative observe and document the construction of the engineered system to verify the system was installed in accordance with the project plans and specifications.

In some areas extending the basin deeper to expose the underlying "cleaner" sands (with USCS Group Symbol "SP") would be advantageous for stormwater infiltration.

Factors, such as the buildup of soil fines or debris, over time, can result in a reduction in the design infiltration rate. It is important to use sediment forebays and other filtering or separation methods to prevent fine soil and debris from entering stormwater management systems that rely on infiltration drainage. Provisions should be included for performing routine maintenance to maintain suitable infiltration properties.

Engineering recommendations related to the design of the proposed stormwater management system were not requested and were not included in this scope of services. Therefore, SME is not responsible for the interpretation by others of our test results presented in Table 2. SME can provide engineering recommendations, or additional interpretation of the design implications associated with the test data, if requested.

4.7 SULFATE TEST RESULTS

Table 3 below summarizes the results of the soluble sulfate testing.

TABLE 3: SOIL CORROSIVITY TEST DATA

BORING	DEPTH (feet)	SOIL TYPE	SULFATE (ppm)[1]
B4	0.5-2	Fine to Medium Sand Fill (SP)	13
B5	2-4	Fine to Medium Sand (SP)	24
B7	4-6	Fine to Medium Sand (SP)	13

NOTES:
1. Detection Limit is 10 parts per million (ppm).

Based on the above laboratory test results for soluble sulfate, the sulfate exposure is considered negligible, and no special cement type is required for cast in place concrete on-grade.

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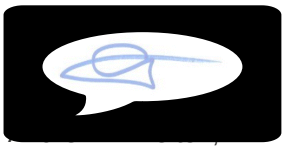
5. SIGNATURES

REPORT PREPARED BY:



Senior Project Engineer

REPORT REVIEWED BY:



Senior Consultant

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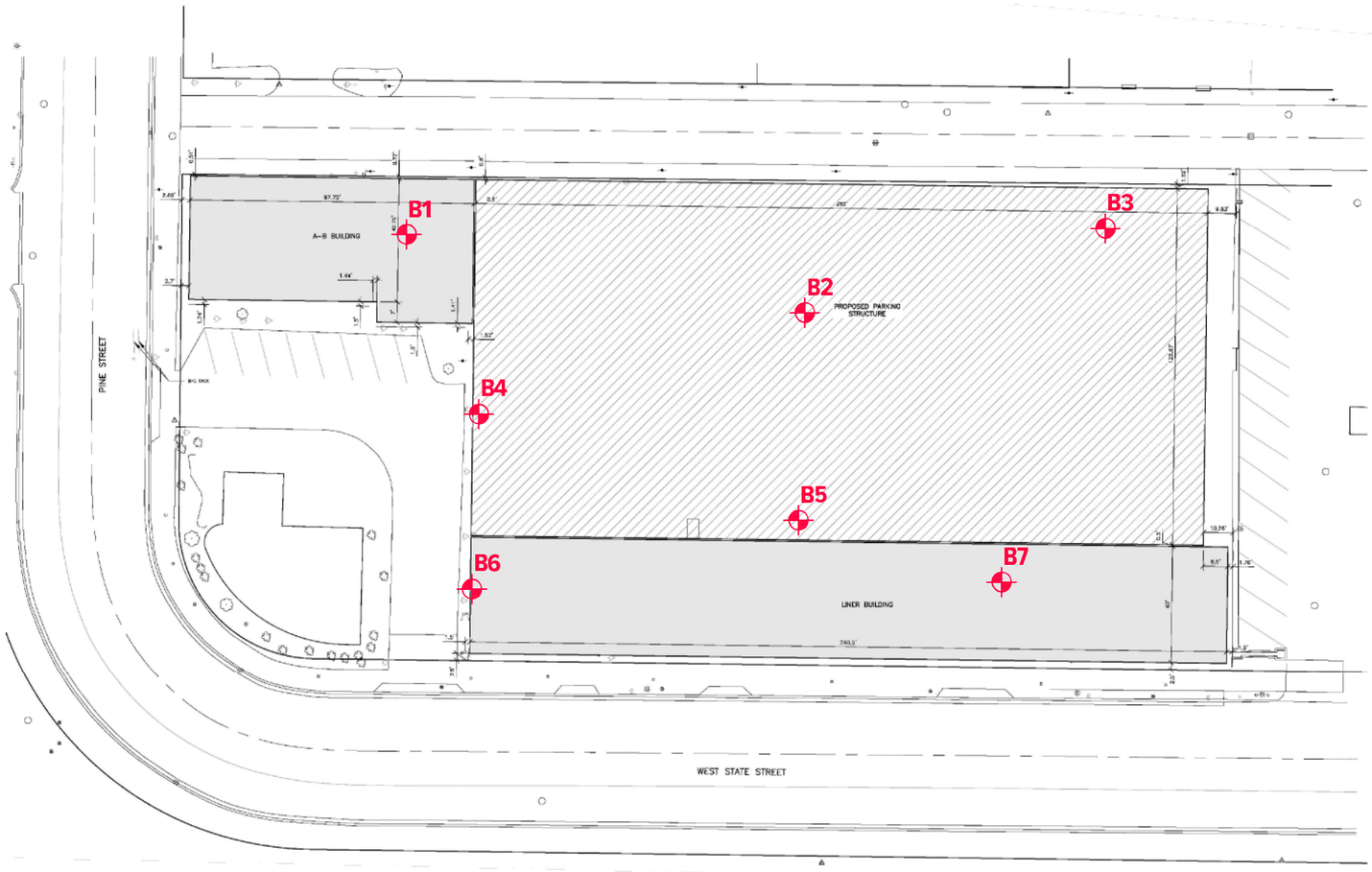
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APPENDIX A

BORING LOCATION DIAGRAM (FIGURE NO. 1)
BORING LOG TERMINOLOGY
BORING LOGS (B1 THROUGH B7)
PRESSUREMETER TEST RESULTS (8 PLOTS)

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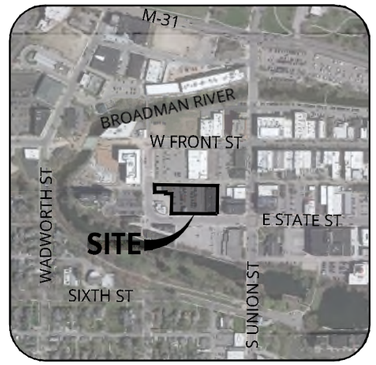
N
W E
S

0' 50' 100'

GRAPHIC SCALE: 1" = 50'

LEGEND

APPROXIMATE BORING LOCATION



LOCATION MAP

NOT TO SCALE

N
W E
S

NOTES:

1. BASE DRAWING INFORMATION WAS TAKEN FROM A DRAWING TITLED "SITE LAYOUT PLAN" (SHEET NO. C201) PREPARED BY AND RECEIVED FROM FISHBECK VIA EMAIL ON OCTOBER 13, 2023.
2. AERIAL IMAGE TAKEN FROM GOOGLE EARTH PRO WITH AN IMAGE DATE OF 5-6-2022.

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Project
WEST END MIXED-USE DEVELOPMENT

Project Location
TRAVERSE CITY, MICHIGAN

Sheet Name
BORING LOCATION DIAGRAM

No.	Revision Date

Date	10-30-2023
CADD	MNR
Designer	PEA
Scale	AS NOTED
Project	093377.00
Figure No.	1

DRAWING NOTE: SCALE DEPICTED IS MEANT FOR 11" X 17" AND WILL SCALE INCORRECTLY IF PRINTED ON ANY OTHER SIZE MEDIA

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BORING LOG TERMINOLOGY

UNIFIED SOIL CLASSIFICATION AND SYMBOL CHART

COARSE-GRAINED SOIL (more than 50% of material is larger than No. 200 sieve size.)			
GRAVEL More than 50% of coarse fraction larger than No. 4 sieve size	Clean Gravel (Less than 5% fines)	GW	Well-graded gravel; gravel-sand mixtures, little or no fines
		GP	Poorly-graded gravel; gravel-sand mixtures, little or no fines
	Gravel with fines (More than 12% fines)	GM	Silty gravel; gravel-sand-silt mixtures
		GC	Clayey gravel; gravel-sand-clay mixtures
SAND 50% or more of coarse fraction smaller than No. 4 sieve size	Clean Sand (Less than 5% fines)	SW	Well-graded sand; sand-gravel mixtures, little or no fines
		SP	Poorly graded sand; sand-gravel mixtures, little or no fines
	Sand with fines (More than 12% fines)	SM	Silty sand; sand-silt-gravel mixtures
		SC	Clayey sand; sand–clay-gravel mixtures
FINE-GRAINED SOIL (50% or more of material is smaller than No. 200 sieve size)			
SILT AND CLAY Liquid limit less than 50%		ML	Inorganic silt; sandy silt or gravelly silt with slight plasticity
		CL	Inorganic clay of low plasticity; lean clay, sandy clay, gravelly clay
		OL	Organic silt and organic clay of low plasticity
SILT AND CLAY Liquid limit 50% or greater		MH	Inorganic silt of high plasticity, elastic silt
		CH	Inorganic clay of high plasticity, fat clay
		OH	Organic silt and organic clay of high plasticity
HIGHLY ORGANIC SOIL		PT	Peat and other highly organic soil

OTHER MATERIAL SYMBOLS

Topsoil, Void, Sandstone, Asphalt Concrete, Glacial Till, Siltstone, Aggregate Base, Coal, Limestone, Portland Cement Concrete, Shale, Fill

LABORATORY CLASSIFICATION CRITERIA

GW	$C_U = \frac{D_{60}}{D_{10}}$ greater than 4; $C_C = \frac{D_{30}^2}{D_{10} \times D_{60}}$ between 1 and 3	
GP	Not meeting all gradation requirements for GW	
GM	Atterberg limits below "A" line or PI less than 4	Above "A" line with PI between 4 and 7 are borderline cases requiring use of dual symbols
GC	Atterberg limits above "A" line with PI greater than 7	
SW	$C_U = \frac{D_{60}}{D_{10}}$ greater than 6; $C_C = \frac{D_{30}^2}{D_{10} \times D_{60}}$ between 1 and 3	
SP	Not meeting all gradation requirements for SW	
SM	Atterberg limits below "A" line or PI less than 4	Above "A" line with PI between 4 and 7 are borderline cases requiring use of dual symbols
SC	Atterberg limits above "A" line with PI greater than 7	

Determine percentages of sand and gravel from grain-size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size), coarse-grained soils are classified as follows:

Less than 5 percent……GW, GP, SW, SP
More than 12 percent……GM, GC, SM, SC
5 to 12 percent……Cases requiring dual symbols

- SP-SM or SW-SM (SAND with Silt or SAND with Silt and Gravel)
- SP-SC or SW-SC (SAND with Clay or SAND with Clay and Gravel)
- GP-GM or GW-GM (GRAVEL with Silt or GRAVEL with Silt and Sand)
- GP-GC or GW-GC (GRAVEL with Clay or GRAVEL with Clay and Sand)

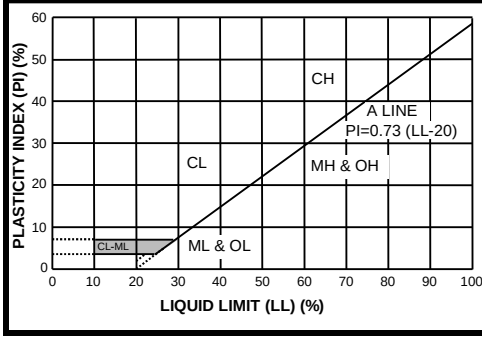
If the fines are CL-ML:

- SC-SM (SILTY CLAYEY SAND or SILTY CLAYEY SAND with Gravel)
- SM-SC (CLAYEY SILTY SAND or CLAYEY SILTY SAND with Gravel)
- GC-GM (SILTY CLAYEY GRAVEL or SILTY CLAYEY GRAVEL with Sand)

PARTICLE SIZES

Boulders	-	Greater than 12 inches
Cobbles	-	3 inches to 12 inches
Gravel- Coarse	-	3/4 inches to 3 inches
Fine	-	No. 4 to 3/4 inches
Sand- Coarse	-	No. 10 to No. 4
Medium	-	No. 40 to No. 10
Fine	-	No. 200 to No. 40
Silt and Clay	-	Less than (0.074 mm)

PLASTICITY CHART



VISUAL MANUAL PROCEDURE

When laboratory tests are not performed to confirm the classification of soils exhibiting borderline classifications, the two possible classifications would be separated with a slash, as follows:

For soils where it is difficult to distinguish if it is a coarse or fine-grained soil:

- SC/CL (CLAYEY SAND to Sandy LEAN CLAY)
- SM/ML (SILTY SAND to SANDY SILT)
- GC/CL (CLAYEY GRAVEL to Gravelly LEAN CLAY)
- GM/ML (SILTY GRAVEL to Gravelly SILT)

For soils where it is difficult to distinguish if it is sand or gravel, poorly or well-graded sand or gravel; silt or clay; or plastic or non-plastic silt or clay:

- SP/GP or SW/GW (SAND with Gravel to GRAVEL with Sand)
- SC/GC (CLAYEY SAND with Gravel to CLAYEY GRAVEL with Sand)
- SM/GM (SILTY SAND with Gravel to SILTY GRAVEL with Sand)
- SW/SP (SAND or SAND with Gravel)
- GP/GW (GRAVEL or GRAVEL with Sand)
- SC/SM (CLAYEY to SILTY SAND)
- GM/GC (SILTY to CLAYEY GRAVEL)
- CL/ML (SILTY CLAY)
- ML/CL (CLAYEY SILT)
- CH/MH (FAT CLAY to ELASTIC SILT)
- CL/CH (LEAN to FAT CLAY)
- MH/ML (ELASTIC SILT to SILT)

DRILLING AND SAMPLING ABBREVIATIONS

2ST	–	Shelby Tube – 2" O.D.
3ST	–	Shelby Tube – 3" O.D.
AS	–	Auger Sample
GS	–	Grab Sample
LS	–	Liner Sample
NR	–	No Recovery
PM	–	Pressuremeter
RC	–	Rock Core diamond bit. NX size, except where noted
SB	–	Split Barrel Sample 1-3/8" I.D., 2" O.D., except where noted
VS	–	Vane Shear
WS	–	Wash Sample

OTHER ABBREVIATIONS

WOH	–	Weight of Hammer
WOR	–	Weight of Rods
SP	–	Soil Probe
PID	–	Photo Ionization Device
FID	–	Flame Ionization Device

DEPOSITIONAL FEATURES

Parting	–	as much as 1/16 inch thick
Seam	–	1/16 inch to 1/2 inch thick
Layer	–	1/2 inch to 12 inches thick
Stratum	–	greater than 12 inches thick
Pocket	–	deposit of limited lateral extent
Lens	–	lenticular deposit
Hardpan/Till	–	an unstratified, consolidated or cemented mixture of clay, silt, sand and/or gravel, the size/shape of the constituents vary widely
Lacustrine	–	soil deposited by lake water
Mottled	–	soil irregularly marked with spots of different colors that vary in number and size
Varved	–	alternating partings or seams of silt and/or clay
Occasional	–	one or less per foot of thickness
Frequent	–	more than one per foot of thickness
Interbedded	–	strata of soil or beds of rock lying between or alternating with other strata of a different nature

DESCRIPTION OF RELATIVE QUANTITIES

The visual-manual procedure uses the following terms to describe the relative quantities of notable foreign materials, gravel, sand or fines:

Trace	–	particles are present but estimated to be less than 5%
Few	–	5 to 10%
Little	–	15 to 25%
Some	–	30 to 45%
Mostly	–	50 to 100%

CLASSIFICATION TERMINOLOGY AND CORRELATIONS

Cohesionless Soils

Relative Density	N_{60} (N-Value) (Blows per foot)
Very Loose	0 to 4
Loose	5 to 10
Medium Dense	11 to 30
Dense	31 to 50
Very Dense	51 to 80
Extremely Dense	Over 81

Cohesive Soils

Consistency	N_{60} (N-Value) (Blows per foot)	Undrained Shear Strength (kips/ft^2)
Very Soft	<2	0.25 or less
Soft	2 - 4	> 0.25 to 0.50
Medium	5 - 8	> 0.50 to 1.0
Stiff	9 - 15	> 1.0 to 2.0
Very Stiff	16 - 30	> 2.0 to 4.0
Hard	> 30	> 4.0 or greater

Standard Penetration 'N-Value' = Blows per foot of a 140-pound hammer falling 30 inches on a 2-inch O.D. split barrel sampler, except where noted. N60 values as reported on boring logs represent raw N-values corrected for hammer efficiency only.

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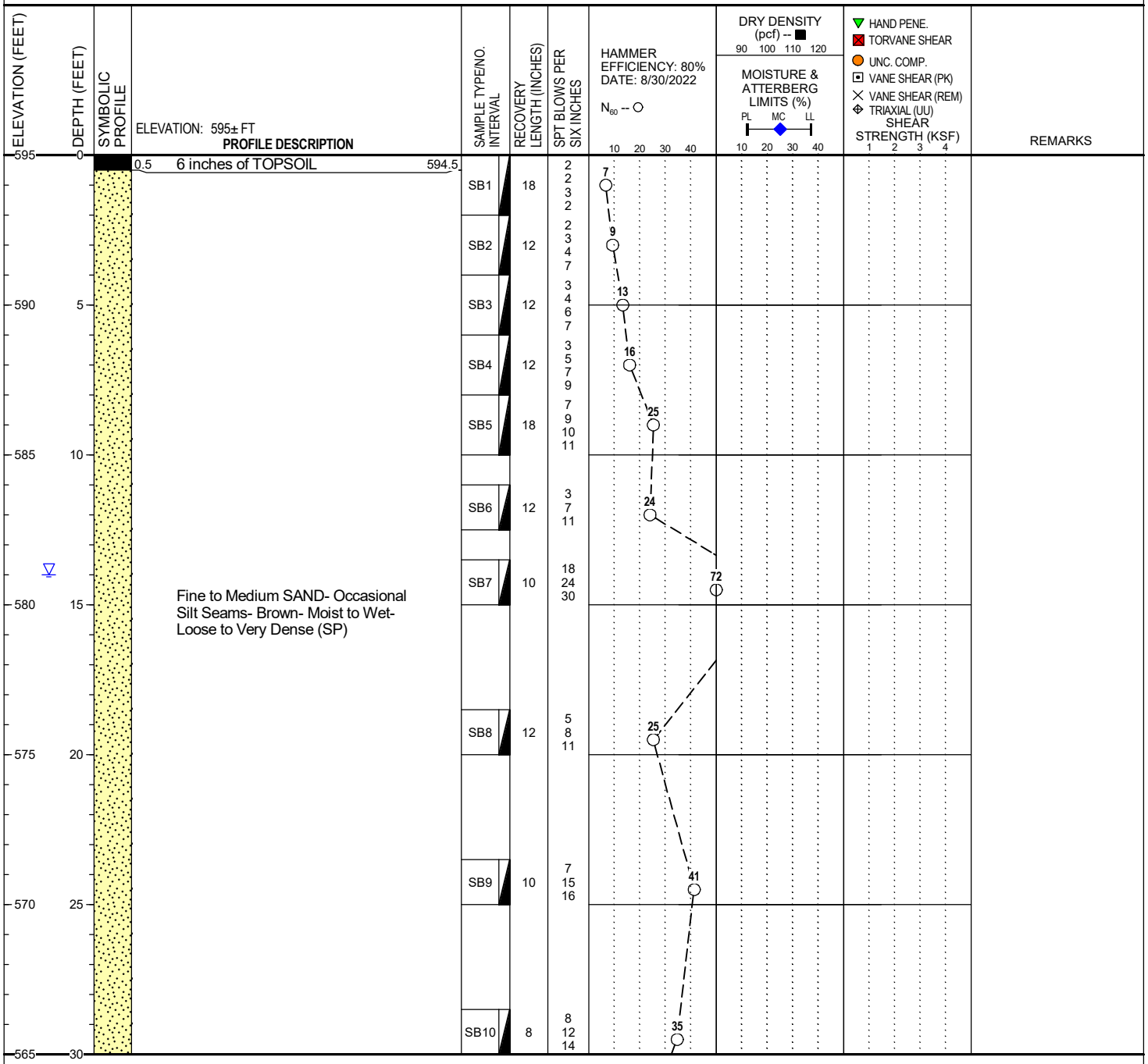
BORING B1

BORING DEPTH: 60 FEET

PROJECT NAME: West End Mixed-Use Development
PROJECT NUMBER: 093377.00
CLIENT: Fishbeck
PROJECT LOCATION: Traverse City, Michigan

DATE STARTED: 9/14/23 **COMPLETED:** 9/14/23 **BORING METHOD:** Note 3

DRILLER: JN **RIG NO.:** 526 (CME 55) **LOGGED BY:** NBS **CHECKED BY:** ATB



GROUNDWATER & BACKFILL INFORMATION

	DEPTH (FT)	ELEV (FT)
▽ **DURING BORING:**	14.0	581.0
▼ **AT END OF BORING:**	Note 3	
CAVE-IN OF BOREHOLE AT:	14.0	581.0

BACKFILL METHOD: Note 4

NOTES:
1. The indicated stratification lines are approximate. The in-situ transitions between materials may be gradual.
2. The colors depicted on the symbolic profile are solely for visualization purposes and do not necessarily represent the in-situ colors encountered.
3. Hollow-stem augers were used to advance the borehole to 15 feet below the ground surface. Wash rotary drilling was then used to the explored depth of the boring; therefore, an accurate groundwater level measurement was not obtained after the completion of drilling activities.
4. Borehole backfilled with auger cuttings from 60 to 14 feet, bentonite chips from 14 to 12 feet; and auger cuttings above 12 feet to the ground surface.

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SME

BORING B1

BORING DEPTH: 60 FEET

PROJECT NAME: West End Mixed-Use Development

PROJECT NUMBER: 093377.00

CLIENT: Fishbeck

PROJECT LOCATION: Traverse City, Michigan

ELEVATION: 595± FT

ELEVATION (FEET)	DEPTH (FEET)	PROFILE DESCRIPTION	SAMPLE TYPE/NO. INTERVAL	RECOVERY LENGTH (INCHES)	SPT BLOWS PER SIX INCHES
565	30				
		Fine to Medium SAND- Occasional Silt Seams- Brown- Moist to Wet- Loose to Very Dense (SP) *(continued)*	SB11	8	6 5 4
560	35		SB12	10	9 12 15
555	40		SB13	18	8 12 14
550	45				
48.5	546.5				
		Fine SAND with Silt- Clayey Silt Layer from 48.5 to 49.0 feet- Brown- Wet- Very Dense (SP-SM)	SB14	12	22 30 30
545	50				
53.5	541.5				
		Fine to Medium SAND- Brown- Wet- Extremely Dense to Very Dense (SP)	SB15	18	12 27 47
540	55				
			SB16	12	14 19 22
535	60				
60.0	535.0				
		END OF BORING AT 60.0 FEET.			
530	65				
525	70				

HAMMER EFFICIENCY: 80%
DATE: 8/30/2022
N_{60} -- ○

DRY DENSITY (pcf) -- ■
90 100 110 120

MOISTURE & ATTERBERG LIMITS (%)
PL MC LL
10 20 30 40

HAND PENE.
TORVANE SHEAR
UNC. COMP.
VANE SHEAR (PK)
VANE SHEAR (REM)
TRIAXIAL (UU)
SHEAR STRENGTH (KSF)
1 2 3 4

REMARKS

Moisture Content and hand penetrometer test results recorded for sample SB14 were performed on a clayey silt layer.

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SME

BORING B2

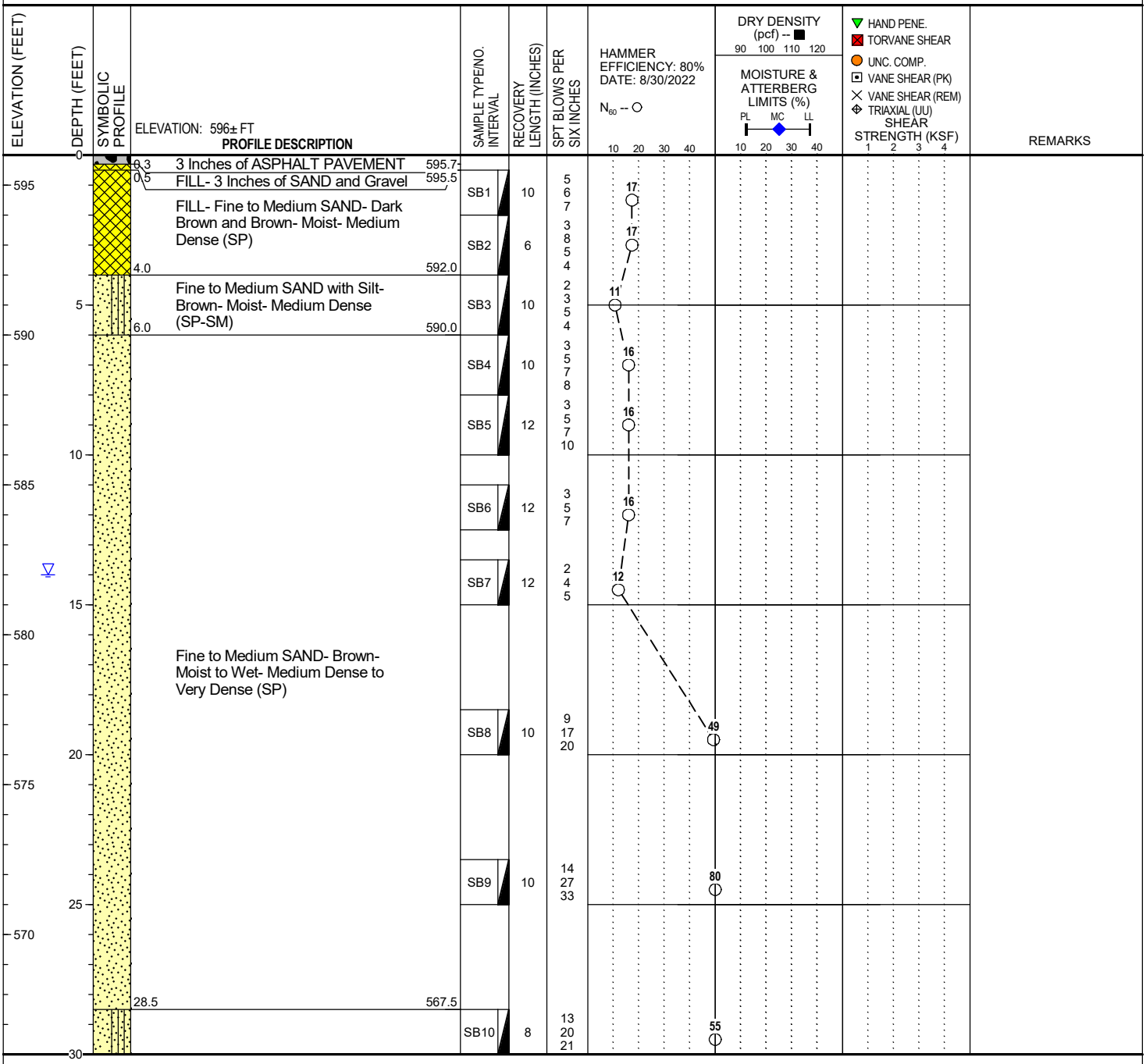
BORING DEPTH: 60 FEET

PROJECT NAME: West End Mixed-Use Development **PROJECT NUMBER:** 093377.00

CLIENT: Fishbeck **PROJECT LOCATION:** Traverse City, Michigan

DATE STARTED: 9/11/23 **COMPLETED:** 9/11/23 **BORING METHOD:** Note 3

DRILLER: JN **RIG NO.:** 526 (CME 55) **LOGGED BY:** NBS **CHECKED BY:** ATB



GROUNDWATER & BACKFILL INFORMATION

	DEPTH (FT)	ELEV (FT)
▽ **DURING BORING:**	14.0	582.0
▼ **AT END OF BORING:**	Note 3	

BACKFILL METHOD: Note 4

NOTES:
1. The indicated stratification lines are approximate. The in-situ transitions between materials may be gradual.
2. The colors depicted on the symbolic profile are solely for visualization purposes and do not necessarily represent the in-situ colors encountered.
3. Hollow-stem augers were used to advance the borehole to 15 feet below the ground surface. Wash rotary drilling was then used to the explored depth of the boring; therefore, an accurate groundwater level measurement was not obtained after the completion of drilling activities.
4. Borehole backfilled with auger cuttings from 60 to 14; bentonite chips from 14 to 12 feet, auger cuttings from 12 to 0 feet to the ground surface.
5. Surface capped with EPCO Hole plug and concrete redi-mix.

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SME

BORING B2

BORING DEPTH: 60 FEET

PROJECT NAME: West End Mixed-Use Development

PROJECT NUMBER: 093377.00

CLIENT: Fishbeck

PROJECT LOCATION: Traverse City, Michigan

ELEVATION: 596± FT

ELEVATION (FEET)	DEPTH (FEET)	PROFILE DESCRIPTION	SAMPLE TYPE/NO. INTERVAL	RECOVERY LENGTH (INCHES)	SPT BLOWS PER SIX INCHES	REMARKS
565	30	Fine to Medium SAND with Silt- Occasional Silty Sand Layers and Seams- Brown- Wet- Very Dense (SP-SM) *(continued)*				
	33.5 / 562.5		SB11	12	10 14 22	
560	35	Fine SAND with Silt- Brown- Wet- Dense (SM-SP)				
	38.5 / 557.5		SB12	10	20 43 40	
555	40	Fine to Medium SAND- Brown- Wet- Extremely Dense to Very Dense (SP)				
			SB13	18	17 20 26	
550	45					
	48.5 / 547.5					
	49.5 / 546.5	CLAYEY SILT- Brown- Very Stiff (CL/ML)	SB14	18	3 6 26	
545	50	Fine to Medium SAND- Brown- Wet- Very Dense to Dense (SP)				
	54.5 / 541.5		SB15	12	37 14 17	Sample SB15, from 54.5 to 55 feet, was too disturbed to perform a shear strength test.
540	55	SILTY CLAY- Gray- Hard (CL/ML)				
	58.5 / 537.5					
	60.0 / 536.0	Fine to Medium SAND- Brown- Wet- Extremely Dense (SP)	SB16	16	17 28 35	
535	60	END OF BORING AT 60.0 FEET.				
530	65					
	70					

HAMMER EFFICIENCY: 80%
DATE: 8/30/2022
N_{60} -- ○

DRY DENSITY (pcf) -- ■
90 100 110 120

MOISTURE & ATTERBERG LIMITS (%)
PL MC LL
10 20 30 40

HAND PENE. ▽
TORVANE SHEAR ⊠
UNC. COMP. ●
VANE SHEAR (PK) ⊡
VANE SHEAR (REM) ×
TRIAXIAL (UU) ⊕
SHEAR STRENGTH (KSF)
1 2 3 4

48 111 61 43 20 41 27 84

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SME

BORING B3

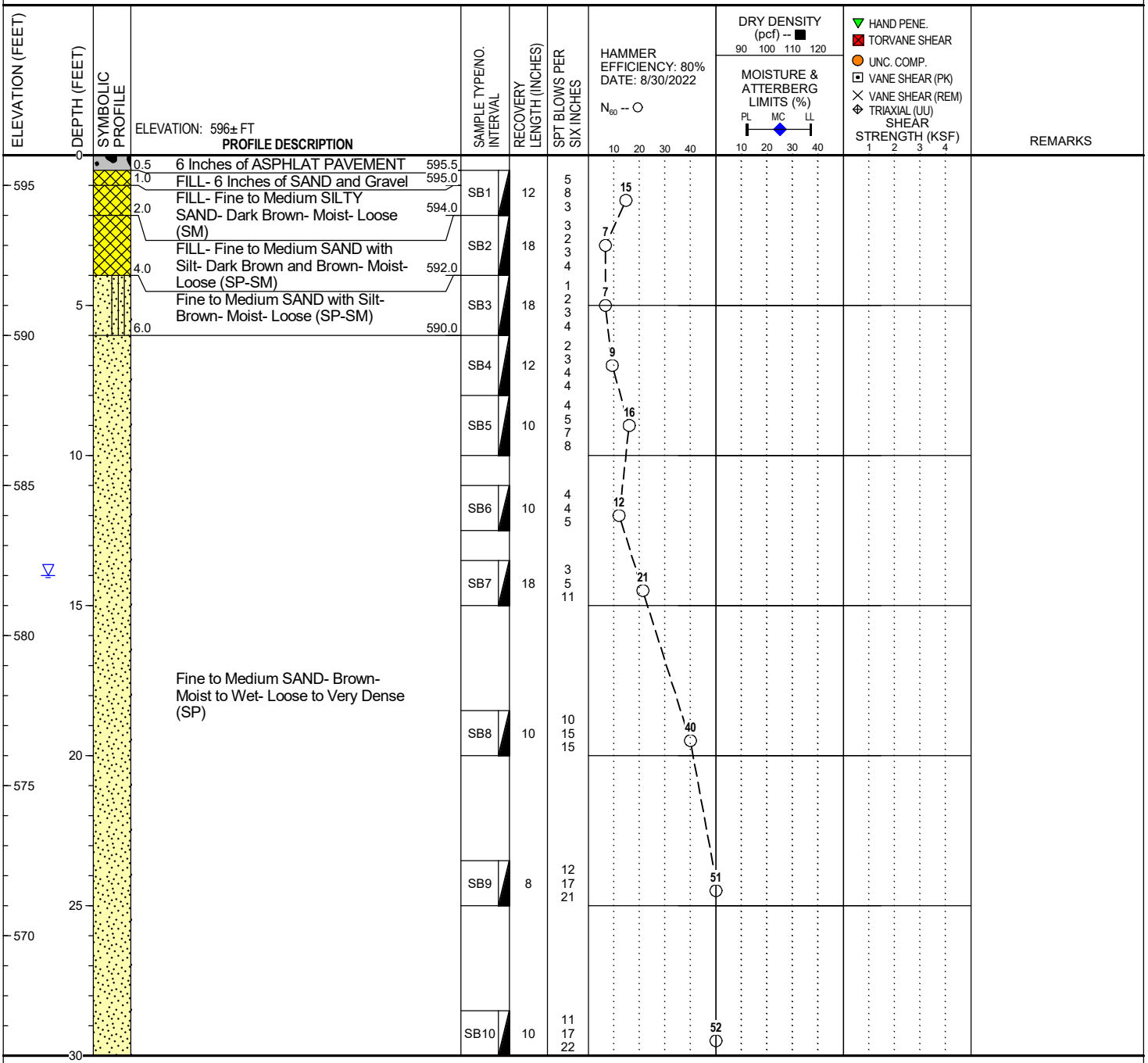
BORING DEPTH: 60 FEET

PROJECT NAME: West End Mixed-Use Development **PROJECT NUMBER:** 093377.00

CLIENT: Fishbeck **PROJECT LOCATION:** Traverse City, Michigan

DATE STARTED: 9/12/23 **COMPLETED:** 9/12/23 **BORING METHOD:** Note 3

DRILLER: JN **RIG NO.:** 526 (CME 55) **LOGGED BY:** NBS **CHECKED BY:** ATB



GROUNDWATER & BACKFILL INFORMATION

	DEPTH (FT)	ELEV (FT)
▽ **DURING BORING:**	14.0	582.0
▼ **AT END OF BORING:**	Note 3	

BACKFILL METHOD: Note 4

NOTES:
1. The indicated stratification lines are approximate. The in-situ transitions between materials may be gradual.
2. The colors depicted on the symbolic profile are solely for visualization purposes and do not necessarily represent the in-situ colors encountered.
3. Hollow-stem augers were used to advance the borehole to 15 feet below the ground surface. Wash rotary drilling was then used to the explored depth of the boring; therefore, an accurate groundwater level measurement was not obtained after the completion of drilling activities.
4. Borehole backfilled with auger cuttings from 60 to 14 feet; Bentonite chips from 14 to 12; auger cuttings from 12 to 0 feet to the ground surface.
5. Surface capped with EPCO Hole plug and concrete redi-mix after backfilling the borehole.

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SME

BORING B3

BORING DEPTH: 60 FEET

PROJECT NAME: West End Mixed-Use Development

PROJECT NUMBER: 093377.00

CLIENT: Fishbeck

PROJECT LOCATION: Traverse City, Michigan

ELEVATION: 596± FT

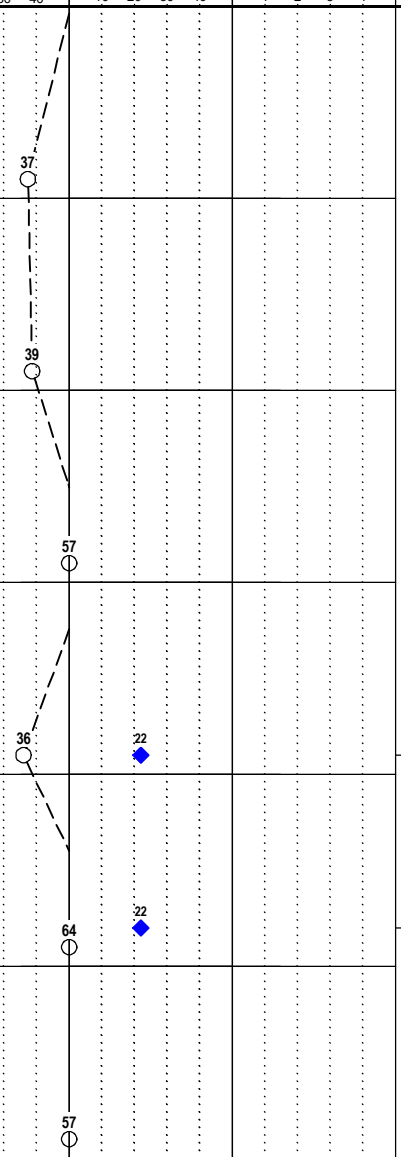
ELEVATION (FEET)	DEPTH (FEET)	PROFILE DESCRIPTION	SAMPLE TYPE/NO. INTERVAL	RECOVERY LENGTH (INCHES)	SPT BLOWS PER SIX INCHES	REMARKS
565	30	Fine to Medium SAND- Brown- Moist to Wet- Loose to Very Dense (SP) *(continued)*				
	33.5 / 562.5		SB11	10	11 12 16	
560	35	Fine to Medium SAND with Silt- Frequent Silt Layers and Seams- Brown- Wet- Dense (SP-SM)				
	38.5 / 557.5		SB12	12	15 14 15	
555	40	Fine to Medium SAND- Frequent Silt Seams- Brown- Wet- Dense to Very Dense (SP)				
			SB13	12	27 20 23	
550	45					
	48.5 / 547.5		SB14	12	19 15 12	Sample SB14 was too disturbed to perform a shear strength test.
545	50	CLAYEY SILT- Gray- Hard (CL/ML)				
	53.5 / 542.5					
	54.5 / 541.5	SILTY CLAY- Few Sand- Gray- Hard (CL/ML)	SB15	18	7 31 17	Sample SB15, from 53.5 to 54.5 feet, was too disturbed to perform a shear strength test.
540	55	Fine to Medium SAND- Brown- Wet- Very Dense (SP)				
	60.0 / 536.0		SB16	12	9 20 23	
535	60	END OF BORING AT 60.0 FEET.				
530	65					
	70					

HAMMER EFFICIENCY: 80%
DATE: 8/30/2022
N_{60} -- ○

DRY DENSITY (pcf) -- ■
90 100 110 120

MOISTURE & ATTERBERG LIMITS (%)
PL MC LL
10 20 30 40

HAND PENE. ▽
TORVANE SHEAR ⊠
UNC. COMP. ●
VANE SHEAR (PK) ⊡
VANE SHEAR (REM) ×
TRIAXIAL (UU) ⊕
SHEAR STRENGTH (KSF)
1 2 3 4



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SME

BORING B4

BORING DEPTH: 60 FEET

PROJECT NAME: West End Mixed-Use Development **PROJECT NUMBER:** 093377.00

CLIENT: Fishbeck **PROJECT LOCATION:** Traverse City, Michigan

DATE STARTED: 9/13/23 **COMPLETED:** 9/13/23 **BORING METHOD:** Note 3

DRILLER: JN **RIG NO.:** 526 (CME 55) **LOGGED BY:** NBS **CHECKED BY:** ATB

ELEVATION: 597± FT

PROFILE DESCRIPTION

0.5 — 6 Inches of ASPHALT PAVEMENT — 596.5

1.5 — FILL- Fine to Medium SAND with Silt and Gravel- Dark Brown- Moist- Medium Dense (SP-SM) — 595.5

4.0 — Fine to Medium SAND with Silt- Brown- Moist- Medium Dense (SP-SM) — 593.0

Fine to Medium SAND- Brown- Moist to Wet- Medium Dense to Very Dense (SP)

SAMPLE TYPE/NO. INTERVAL	RECOVERY LENGTH (INCHES)	SPT BLOWS PER SIX INCHES
SB1	12	6 6 6
SB2	12	4 4 5 6
SB3	12	3 4 6 10
SB4	18	3 4 7 9
SB5	18	3 6 8 8
SB6	12	3 6 8
SB7	12	3 7 10
SB8	18	10 16 22
SB9	8	12 14 22
SB10	8	10 12 14

HAMMER EFFICIENCY: 80%
DATE: 8/30/2022
N_{60} -- ○

DRY DENSITY (pcf) -- ■
90 100 110 120

MOISTURE & ATTERBERG LIMITS (%)
PL MC LL
10 20 30 40

SHEAR STRENGTH (KSF)
1 2 3 4

▽ HAND PENE.
⊠ TORVANE SHEAR
● UNC. COMP.
⊡ VANE SHEAR (PK)
× VANE SHEAR (REM)
⊕ TRIAXIAL (UU)

REMARKS

GROUNDWATER & BACKFILL INFORMATION

	DEPTH (FT)	ELEV (FT)
▽ **DURING BORING:**	16.0	581.0
▼ **AT END OF BORING:**	Note 3	

BACKFILL METHOD: Note 4

NOTES:
1. The indicated stratification lines are approximate. The in-situ transitions between materials may be gradual.
2. The colors depicted on the symbolic profile are solely for visualization purposes and do not necessarily represent the in-situ colors encountered.
3. Hollow-stem augers were used to advance the borehole to 20 feet below the ground surface. Wash rotary drilling was then used to the explored depth of the boring; therefore, an accurate groundwater level measurement was not obtained after the completion of drilling activities.
4. Borehole backfilled with auger cuttings from 60 to 16 feet; Bentonite chips from 16 to 14 feet; auger cuttings from 14 to 0 feet below the ground surface and auger cuttings above 15 feet to the ground surface.
5. Surface capped with EPCO Hole plug and concrete redi-mix after backfilling borehole.

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SME

BORING B4

BORING DEPTH: 60 FEET

PROJECT NAME: West End Mixed-Use Development

PROJECT NUMBER: 093377.00

CLIENT: Fishbeck

PROJECT LOCATION: Traverse City, Michigan

ELEVATION: 597± FT

ELEVATION (FEET)	DEPTH (FEET)	PROFILE DESCRIPTION	SAMPLE TYPE/NO. INTERVAL	RECOVERY LENGTH (INCHES)	SPT BLOWS PER SIX INCHES	REMARKS
565	30					
		Fine to Medium SAND- Brown- Moist to Wet- Medium Dense to Very Dense (SP) *(continued)*	SB11	10	13 16 22	
560	35		SB12	12	16 20 32	
555	40					
		43.5 / 553.5	SB13	12	15 25 35	
550	45	Fine to Medium SAND with Silt- Frequent Silt Layers and Seams- Brown- Wet- Very Dense (SP-SM)				
		48.5 / 548.5	SB14	12	17 27 33	
545	50	Fine SILTY SAND- Brown- Wet- Very Dense (SM)				
		53.5 / 543.5	SB15	12	2 2 4	
540	55	SILTY CLAY- Few Sand- Gray- Soft				
		58.5 / 538.5	SB16	12	11 17 12	
	60	60.0 / 537.0 Fine to Medium SAND- Brown- Wet- Dense (SP)				
		END OF BORING AT 60.0 FEET.				
535						
	65					
530						
	70					

HAMMER EFFICIENCY: 80%
DATE: 8/30/2022
N_{60} -- ○

DRY DENSITY (pcf) -- ■
90 100 110 120

MOISTURE & ATTERBERG LIMITS (%)
PL MC LL
10 20 30 40

HAND PENE.
TORVANE SHEAR
UNC. COMP.
VANE SHEAR (PK)
VANE SHEAR (REM)
TRIAXIAL (UU)
SHEAR STRENGTH (KSF)
1 2 3 4

SPT N-values: 51, 69, 80, 80, 8, 39
Moisture: 27

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SME

BORING B5

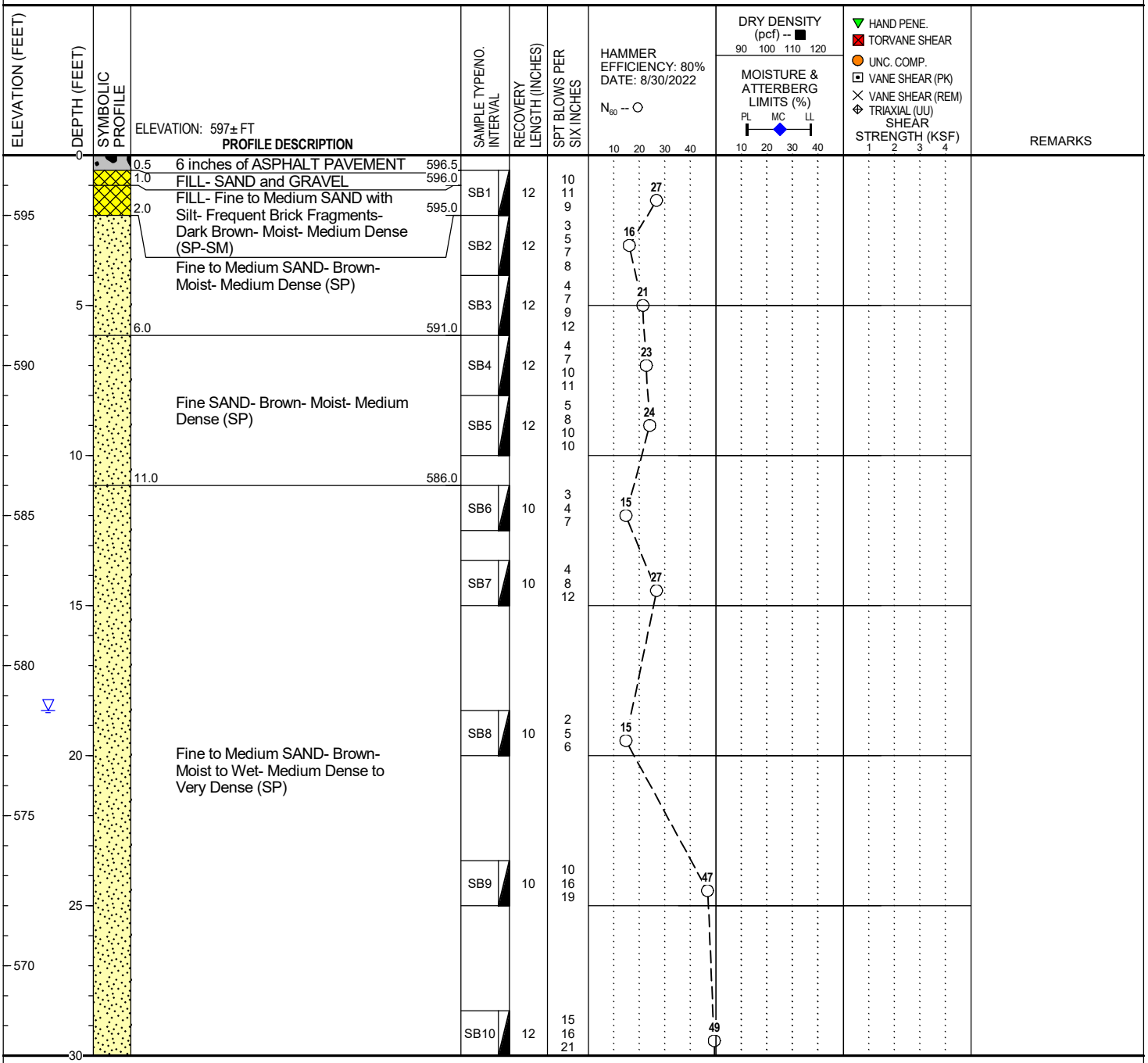
BORING DEPTH: 60 FEET

PROJECT NAME: West End Mixed-Use Development **PROJECT NUMBER:** 093377.00

CLIENT: Fishbeck **PROJECT LOCATION:** Traverse City, Michigan

DATE STARTED: 9/12/23 **COMPLETED:** 9/12/23 **BORING METHOD:** Note 3

DRILLER: JN **RIG NO.:** 526 (CME 55) **LOGGED BY:** NBS **CHECKED BY:** ATB



GROUNDWATER & BACKFILL INFORMATION

	DEPTH (FT)	ELEV (FT)
▽ **DURING BORING:**	18.5	578.5
▼ **AT END OF BORING:**	Note 3	

BACKFILL METHOD: Note 4

NOTES:
1. The indicated stratification lines are approximate. The in-situ transitions between materials may be gradual.
2. The colors depicted on the symbolic profile are solely for visualization purposes and do not necessarily represent the in-situ colors encountered.
3. Hollow-stem augers were used to advance the borehole to 20 feet below the ground surface. Wash rotary drilling was then used to the explored depth of the boring; therefore, an accurate groundwater level measurement was not obtained after the completion of drilling activities.
4. Borehole backfilled with auger cuttings from 60 to 18.5 feet; Bentonite chips from 18.5 to 16.5; auger cuttings from 16.5 to 0 feet to the ground surface.
5. Surface capped with EPCO Hole Plug and Concrete redi-mix after backfilling the borehole.

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SME

BORING B5

BORING DEPTH: 60 FEET

PROJECT NAME: West End Mixed-Use Development

PROJECT NUMBER: 093377.00

CLIENT: Fishbeck

PROJECT LOCATION: Traverse City, Michigan

ELEVATION: 597± FT

ELEVATION (FEET)	DEPTH (FEET)	PROFILE DESCRIPTION	SAMPLE TYPE/NO. INTERVAL	RECOVERY LENGTH (INCHES)	SPT BLOWS PER SIX INCHES	REMARKS
565	30	Fine to Medium SAND- Brown- Moist to Wet- Medium Dense to Very Dense (SP) *(continued)*	SB11	10	13 16 21	
560	35		SB12	12	14 20 23	
555	40		SB13	12	11 20 26	
550	45		SB14	10	11 15 12	
545	50	Fine SAND with Silt- Brown- Wet- Dense (SP-SM)	SB15	18	5 7 23	Sample SB15 was too disturbed to perform a shear strength test.
540	55	LEAN CLAY- Brown- Hard (CL)	SB16	12	14 15 24	
535	60	Fine to Medium SAND- Brown-Wet- Very Dense (SP)				
530	65	END OF BORING AT 60.0 FEET.				
	70					

48.5 / 548.5

53.5 / 543.5

58.5 / 538.5

60.0 / 537.0

HAMMER EFFICIENCY: 80%
DATE: 8/30/2022
N_{60} -- ○

DRY DENSITY (pcf) -- ■
90 100 110 120

MOISTURE & ATTERBERG LIMITS (%)
PL MC LL
10 20 30 40

HAND PENE.
TORVANE SHEAR
UNC. COMP.
VANE SHEAR (PK)
VANE SHEAR (REM)
TRIAXIAL (UU)
SHEAR STRENGTH (KSF)
1 2 3 4

49 57 61 36' 40 24 52

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SME

BORING B6

BORING DEPTH: 60 FEET

PROJECT NAME: West End Mixed-Use Development **PROJECT NUMBER:** 093377.00

CLIENT: Fishbeck **PROJECT LOCATION:** Traverse City, Michigan

DATE STARTED: 9/13/23 **COMPLETED:** 9/13/23 **BORING METHOD:** Note 3

DRILLER: JN **RIG NO.:** 526 (CME 55) **LOGGED BY:** NBS **CHECKED BY:** ATB

ELEVATION: 598± FT

ELEVATION (FEET)	DEPTH (FEET)	PROFILE DESCRIPTION	SAMPLE TYPE/NO. INTERVAL	RECOVERY LENGTH (INCHES)	SPT BLOWS PER SIX INCHES
595	0	0.5 6 Inches of ASPHALT PAVEMENT 597.5			
		1.0 FILL- SAND and GRAVEL (SP-SM) 597.0	SB1	10	6 5 5
		2.0 FILL- Fine to Medium SAND with Silt and Gravel- Dark Brown and Brown- Moist- Medium Dense (SP-SM) 596.0	SB2	12	3 4 5 7
	5	Fine to Medium SAND- Brown- Moist- Medium Dense (SP)	SB3	12	2 5 7 13
		6.0 592.0	SB4	18	3 7 8 10
590		Fine SAND- Brown- Moist- Medium Dense (SP)	SB5	12	3 5 8 10
	10	11.0 587.0	SB6	12	3 5 7
585			SB7	12	4 9 11
	15				
580 ▽			SB8	18	5 12 17
	20	Fine to Medium SAND- Brown- Moist to Wet- Medium Dense to Very Dense (SP)			
575			SB9	10	12 17 21
	25				
570			SB10	10	9 12 15
	30				

HAMMER EFFICIENCY: 80%
DATE: 8/30/2022
N_{60} -- ○

DRY DENSITY (pcf) -- ■
90 100 110 120

MOISTURE & ATTERBERG LIMITS (%)
PL MC LL
10 20 30 40

HAND PENE. ▽
TORVANE SHEAR ⊠
UNC. COMP. ●
VANE SHEAR (PK) ⊡
VANE SHEAR (REM) ×
TRIAXIAL (UU) ⊕
SHEAR STRENGTH (KSF)
1 2 3 4

REMARKS

GROUNDWATER & BACKFILL INFORMATION

	DEPTH (FT)	ELEV (FT)
▽ **DURING BORING:**	18.0	580.0
▼ **AT END OF BORING:**	Note 3	

BACKFILL METHOD: Note 4

NOTES:
1. The indicated stratification lines are approximate. The in-situ transitions between materials may be gradual.
2. The colors depicted on the symbolic profile are solely for visualization purposes and do not necessarily represent the in-situ colors encountered.
3. Hollow-stem augers were used to advance the borehole to 20 feet below the ground surface. Wash rotary drilling was then used to the explored depth of the boring; therefore, an accurate groundwater level measurement was not obtained after the completion of drilling activities.
4. Borehole backfilled with auger cuttings from 60 to 18 feet; Bentonite chips from 18 to 16 feet; auger cuttings from 16 to 0 feet to the ground surface.
5. Surface capped with EPCO hole plug and concrete redi-mix after backfilling the borehole B1.

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SME

BORING B6

BORING DEPTH: 60 FEET

PROJECT NAME: West End Mixed-Use Development

PROJECT NUMBER: 093377.00

CLIENT: Fishbeck

PROJECT LOCATION: Traverse City, Michigan

ELEVATION: 598± FT

ELEVATION (FEET)	DEPTH (FEET)	SYMBOLIC PROFILE	PROFILE DESCRIPTION	SAMPLE TYPE/NO. INTERVAL	RECOVERY LENGTH (INCHES)	SPT BLOWS PER SIX INCHES	REMARKS
565	30			SB11	10	19 21 24	
560	35			SB12	12	15 19 21	
555	40		Fine to Medium SAND- Brown- Moist to Wet- Medium Dense to Very Dense (SP) *(continued)*	SB13	12	12 18 18	
550	45			SB14	12	15 22 24	
545	50		53.5 / 544.5	SB15	12	3 2 2	
540	55		LEAN CLAY- Gray- Medium (CL)				
535	60		58.5 / 539.5 Fine to Medium SAND- Brown- Wet- Very Dense (SP) 60.0 / 538.0	SB16	12	14 19 21	
530	65		END OF BORING AT 60.0 FEET.				
	70						

HAMMER EFFICIENCY: 80%
DATE: 8/30/2022
N_{60} -- ○

DRY DENSITY (pcf) -- ■
90 100 110 120

MOISTURE & ATTERBERG LIMITS (%)
PL MC LL
10 20 30 40

SHEAR STRENGTH (KSF)
1 2 3 4

▽ HAND PENE.
⊠ TORVANE SHEAR
● UNC. COMP.
⊡ VANE SHEAR (PK)
× VANE SHEAR (REM)
⊕ TRIAXIAL (UU)

SPT N-values: 60, 53, 48, 61, 5, 53
Moisture: 29
Hand penetrometer: ▽

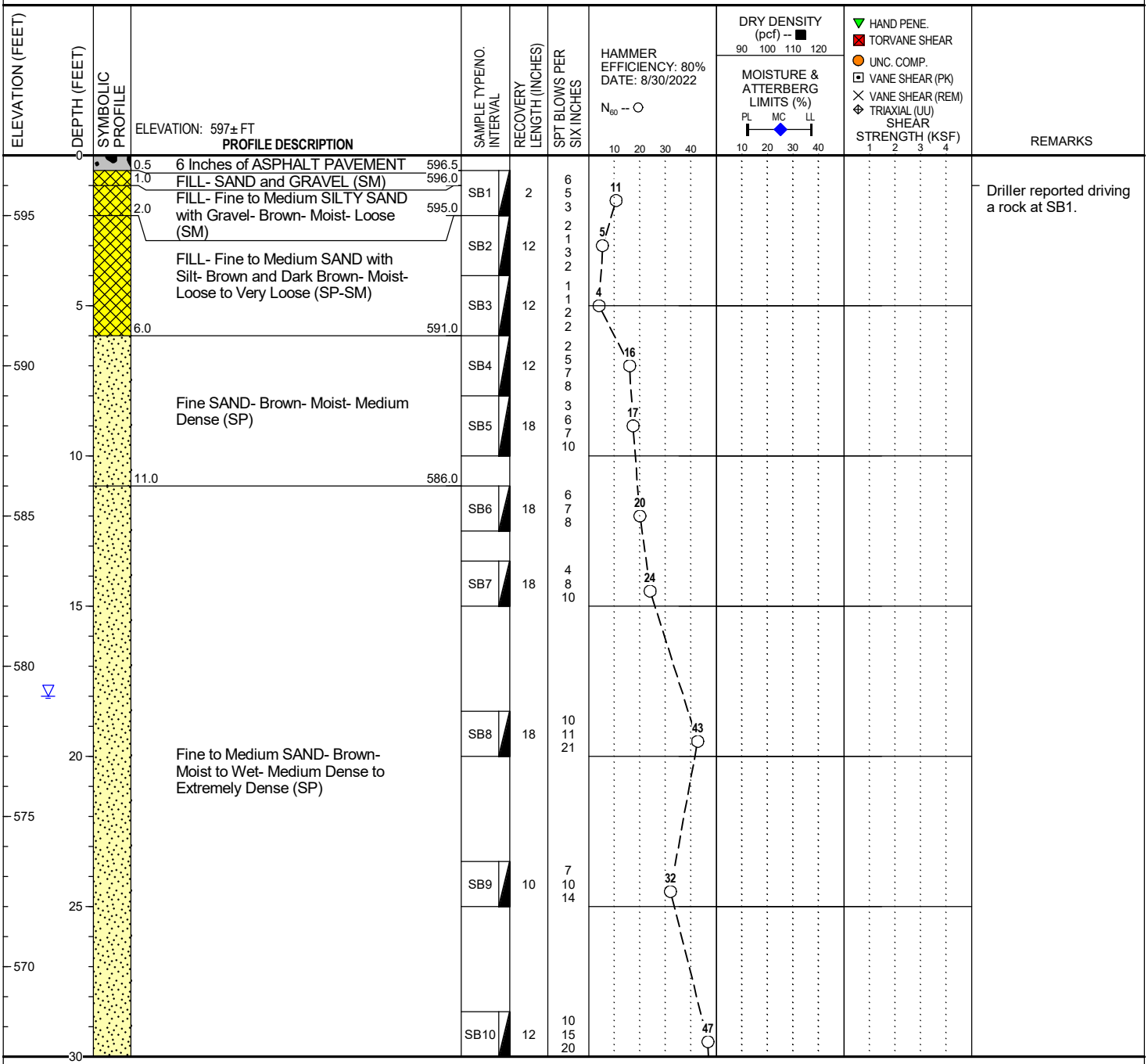
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BORING B7

BORING DEPTH: 60 FEET

PROJECT NAME: West End Mixed-Use Development
PROJECT NUMBER: 093377.00
CLIENT: Fishbeck
PROJECT LOCATION: Traverse City, Michigan
DATE STARTED: 9/12/23 **COMPLETED:** 9/12/23 **BORING METHOD:** Note 3
DRILLER: JN **RIG NO.:** 526 (CME 55) **LOGGED BY:** NBS **CHECKED BY:** ATB



GROUNDWATER & BACKFILL INFORMATION

	DEPTH (FT)	ELEV (FT)
▽ DURING BORING:	18.0	579.0
▼ AT END OF BORING:	Note 3	

BACKFILL METHOD: Note 4

NOTES:
1. The indicated stratification lines are approximate. The in-situ transitions between materials may be gradual.
2. The colors depicted on the symbolic profile are solely for visualization purposes and do not necessarily represent the in-situ colors encountered.
3. Hollow-stem augers were used to advance the borehole to 20 feet below the ground surface. Wash rotary drilling was then used to the explored depth of the boring; therefore, an accurate groundwater level measurement was not obtained after the completion of drilling activities.
4. Borehole backfilled with auger cuttings from 60 to 18 feet; Bentonite chips from 18 to 16 feet; auger cuttings from 16 to 0 feet to the ground surface.
5. Surface capped with EPCO hole plug and concrete redi-mix after backfilling the borehole B1.

(Continued Next Page)

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SME

BORING B7

BORING DEPTH: 60 FEET

PROJECT NAME: West End Mixed-Use Development

PROJECT NUMBER: 093377.00

CLIENT: Fishbeck

PROJECT LOCATION: Traverse City, Michigan

ELEVATION: 597± FT

PROFILE DESCRIPTION

Fine to Medium SAND- Brown- Moist to Wet- Medium Dense to Extremely Dense (SP) *(continued)*

53.5 / 543.5

SILTY CLAY- Frequent Wet Sand Layers and Seams- Gray- Very Stiff (CL/ML)

58.5 / 538.5

Fine to Medium SAND- Brown- Wet- Very Dense (SP)

60.0 / 537.0

END OF BORING AT 60.0 FEET.

SAMPLE TYPE/NO. INTERVAL	RECOVERY LENGTH (INCHES)	SPT BLOWS PER SIX INCHES	N60
SB11	10	12 16 20	48
SB12	10	6 12 19	41
SB13	12	14 18 18	48
SB14	10	20 36 45	108
SB15	12	8 10 8	24 / 18
SB16	12	16 21 24	60

HAMMER EFFICIENCY: 80%
DATE: 8/30/2022
N_{60} -- ○

DRY DENSITY (pcf) -- ■ 90 100 110 120

MOISTURE & ATTERBERG LIMITS (%) PL MC LL 10 20 30 40

▽ HAND PENE.
⊠ TORVANE SHEAR
● UNC. COMP.
⊡ VANE SHEAR (PK)
× VANE SHEAR (REM)
⊕ TRIAXIAL (UU)
SHEAR STRENGTH (KSF) 1 2 3 4

REMARKS

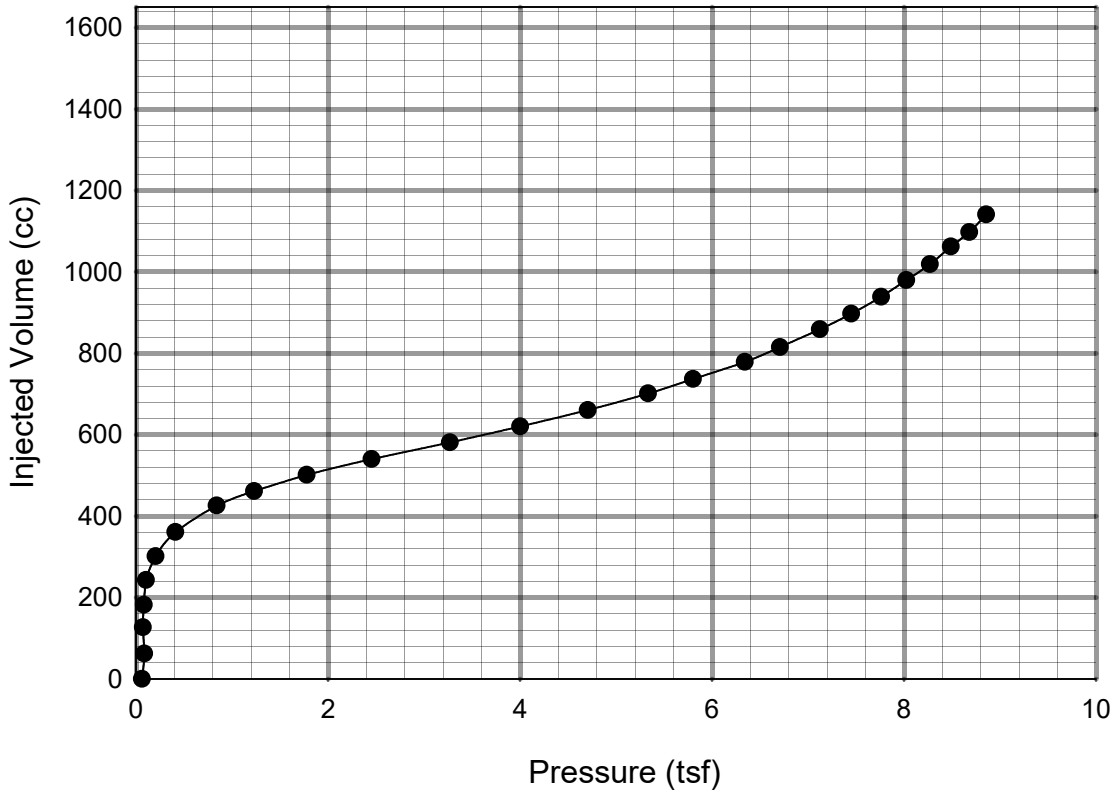
Sample SB15 was too disturbed to perform a shear strength test.

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Pressuremeter Test Results

Project Name: Traverse City West End Parking Structure
Project Location: Traverse City, Michigan
SME Project No.: 093377.00
Test Date: September 18, 2023

Boring No.: Adjacent to B2
Test Depth: 6-8 feet
Soil Description: Fine to Medium SAND- Brown- Moist - Medium Dense
Standard Penetration Test Blow Counts: 3-4-4-5
USCS Symbol: SP



Initial Pressure (Pi): 0.8 tsf

Yield Pressure (Pf): 6.3 tsf

Limit Pressure (Pl): 10 tsf

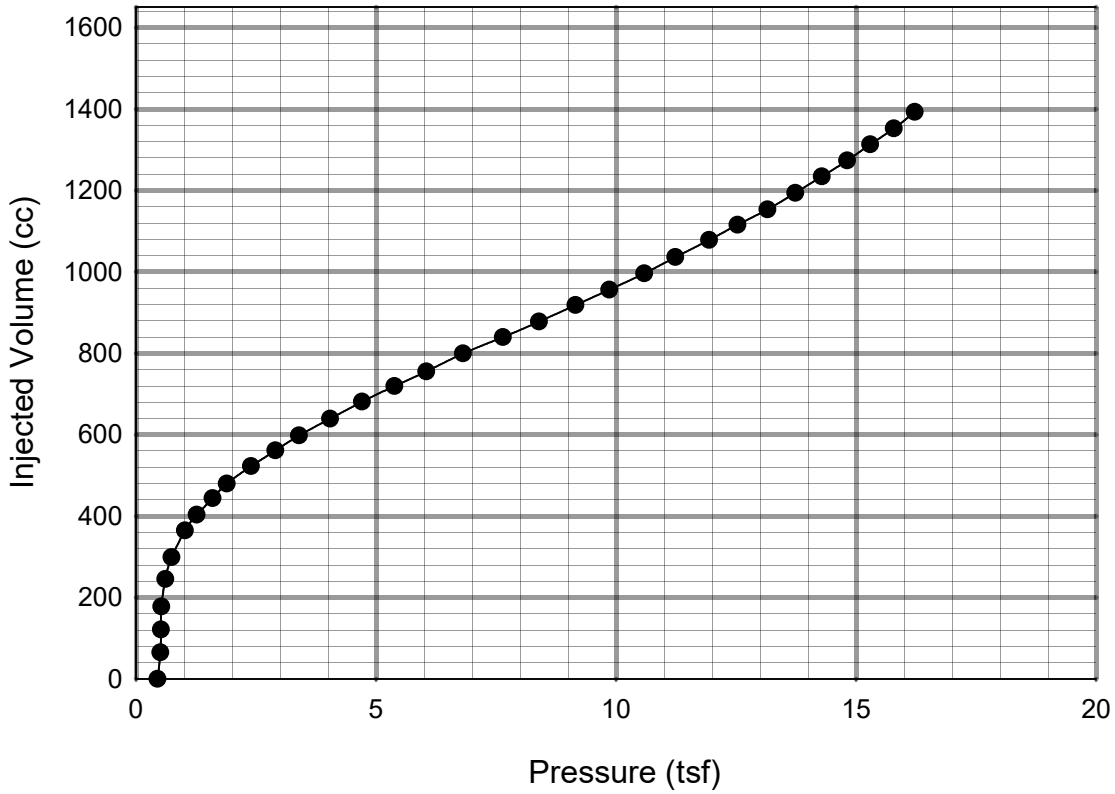
Pressuremeter Modulus (Ed): 92 tsf

DocuSign Envelope ID: 530263C8-1B38-4994-9E74-CDB4C30D6840

Pressuremeter Test Results

Project Name: Traverse City West End Parking Structure
Project Location: Traverse City, Michigan
SME Project No.: 093377.00
Test Date: September 18, 2023

Boring No.: Adjacent to B2
Test Depth: 13-15 feet
Soil Description: Fine to Medium SAND- Brown- Moist to Wet - Medium Dense
Standard Penetration Test Blow Counts: 2-9-12-16
USCS Symbol: SP



Initial Pressure (Pi): 2.4 tsf

Yield Pressure (Pf): 13.2 tsf

Limit Pressure (Pl): Could not be determined

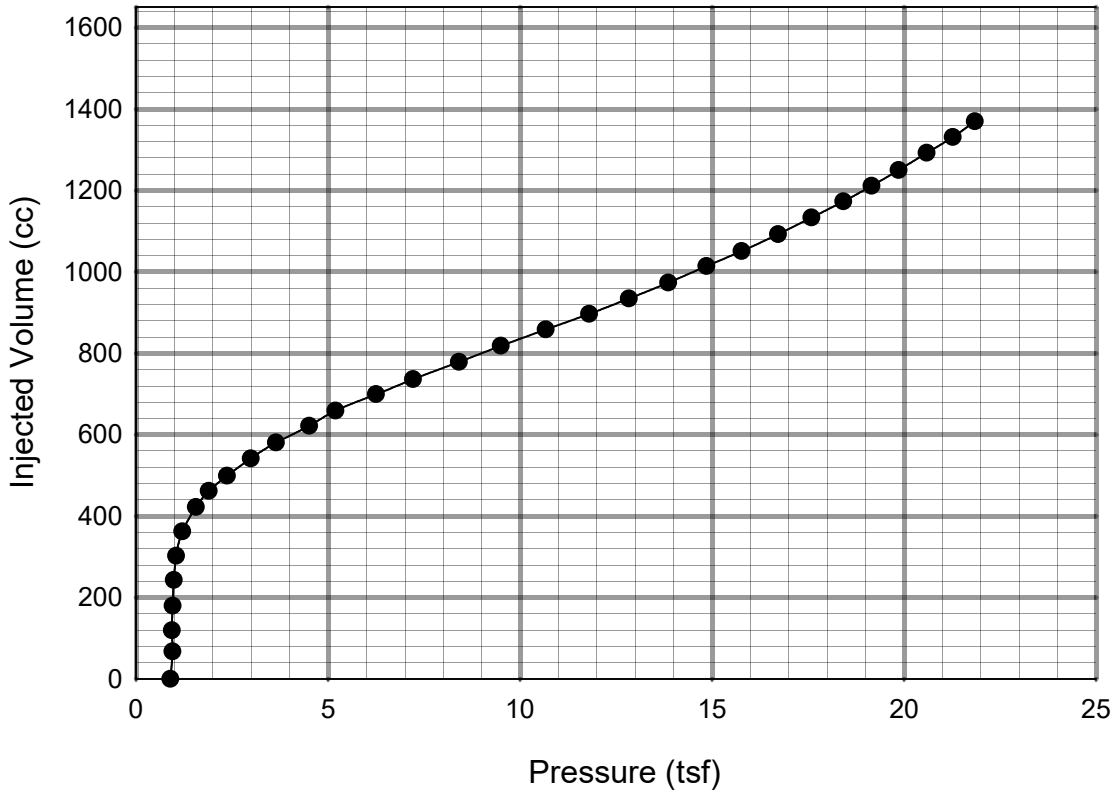
Pressuremeter Modulus (Ed): 112 tsf

DocuSign Envelope ID: 530263C8-1B38-4994-9E74-CDB4C30D6840

Pressuremeter Test Results

Project Name: Traverse City West End Parking Structure
Project Location: Traverse City, Michigan
SME Project No.: 093377.00
Test Date: September 18, 2023

Boring No.: Adjacent to B2
Test Depth: 28-30 feet
Soil Description: Fine to Medium SAND with Silt- Occasional Silty Sand Layers and Seams- Brown- Wet- Very Dense
Standard Penetration Test Blow Counts: 12-18-21-24
USCS Symbol: SP-SM



Initial Pressure (Pi): 3.6 tsf

Yield Pressure (Pf): 17.6 tsf

Limit Pressure (Pl): Could not be determined

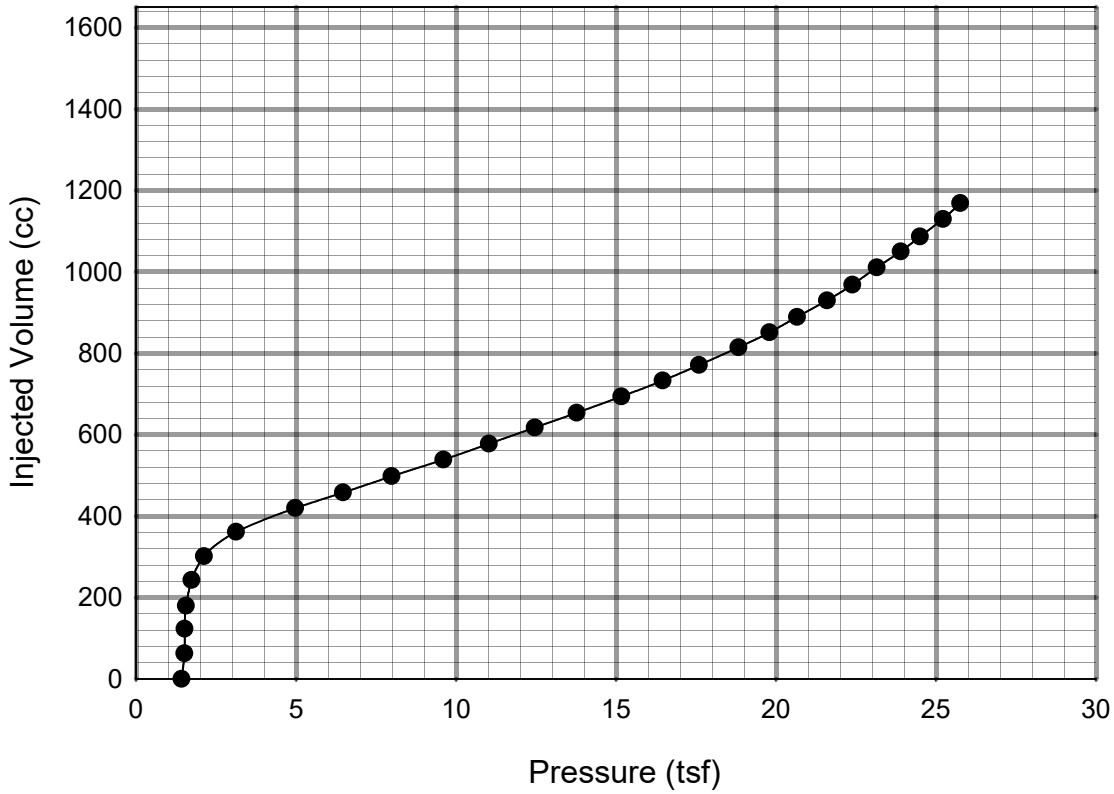
Pressuremeter Modulus (Ed): 167 tsf

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Pressuremeter Test Results

Project Name: Traverse City West End Parking Structure
Project Location: Traverse City, Michigan
SME Project No.: 093377.00
Test Date: September 18, 2023

Boring No.: Adjacent to B2
Test Depth: 43-45 feet
Soil Description: Fine to Medium SAND- Brown - Wet- Dense
Standard Penetration Test Blow Counts: 5-11-19-20
USCS Symbol: SP



Initial Pressure (Pi): 3.1 tsf

Yield Pressure (Pf): 17.6 tsf

Limit Pressure (Pl): 30 tsf

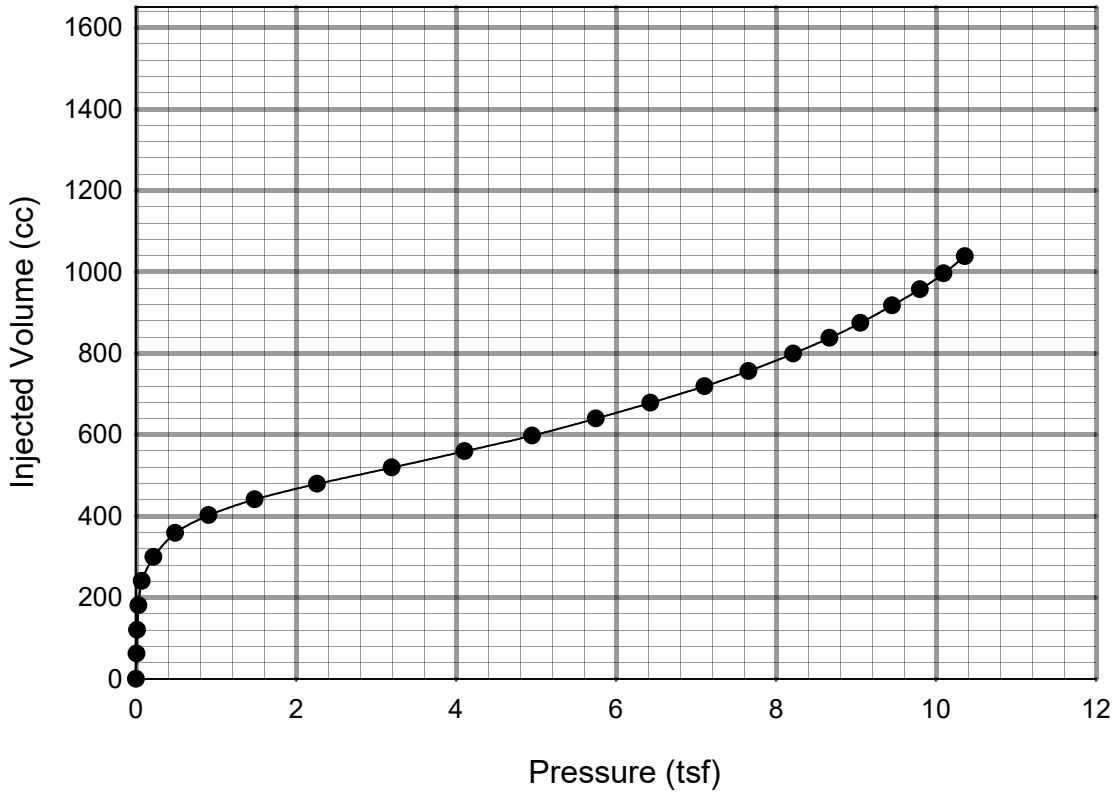
Pressuremeter Modulus (Ed): 206 tsf

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Pressuremeter Test Results

Project Name: Traverse City West End Parking Structure
Project Location: Traverse City, Michigan
SME Project No.: 093377.00
Test Date: September 19, 2023

Boring No.: Adjacent to B6
Test Depth: 4-6 feet
Soil Description: Fine to Medium SAND- Brown- Moist - Medium Dense
Standard Penetration Test Blow Counts: 4-7-8-7
USCS Symbol: SP



Initial Pressure (Pi): 0.9 tsf

Yield Pressure (Pf): 7.1 tsf

Limit Pressure (Pl): 12 tsf

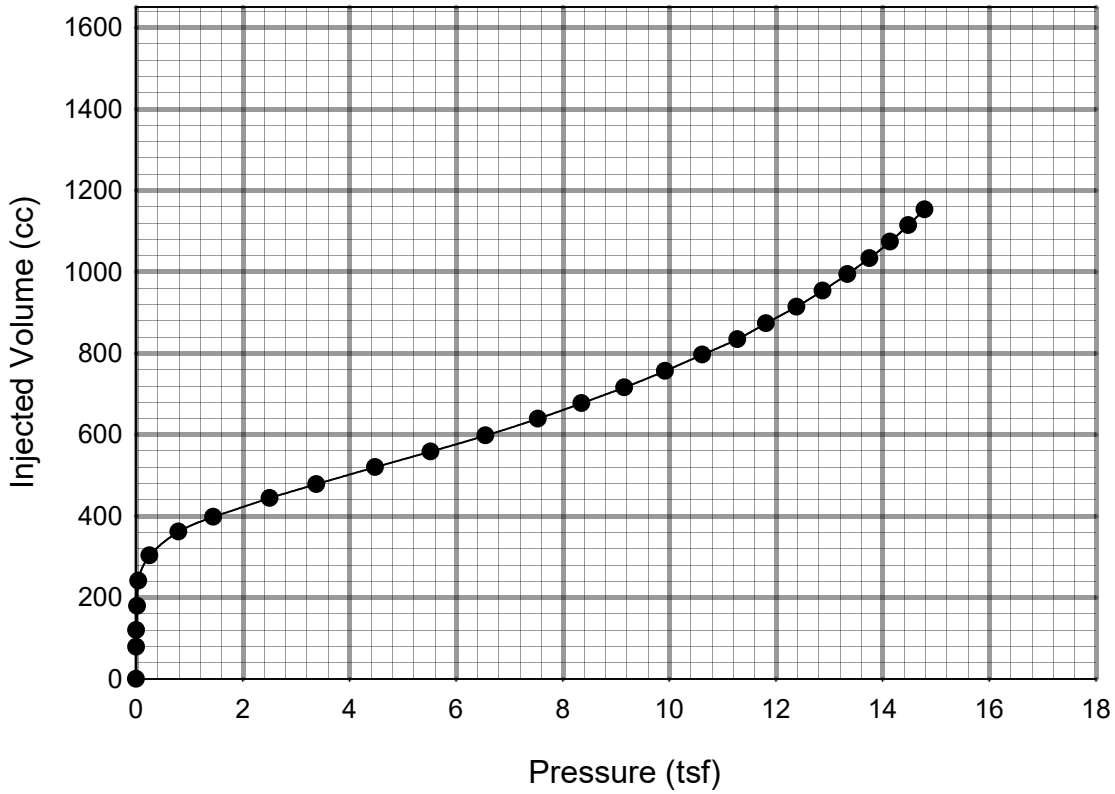
Pressuremeter Modulus (Ed): 114 tsf

DocuSign Envelope ID: 530263C8-1B38-4994-9E74-CDB4C30D6840

Pressuremeter Test Results

Project Name: Traverse City West End Parking Structure
Project Location: Traverse City, Michigan
SME Project No.: 093377.00
Test Date: September 19, 2023

Boring No.: Adjacent to B6
Test Depth: 13-15 feet
Soil Description: Fine to Medium SAND- Brown- Moist - Medium Dense
Standard Penetration Test Blow Counts: 7-7-10-10
USCS Symbol: SP



Initial Pressure (Pi): 1.4 tsf

Yield Pressure (Pf): 8.3 tsf

Limit Pressure (Pl): 18 tsf

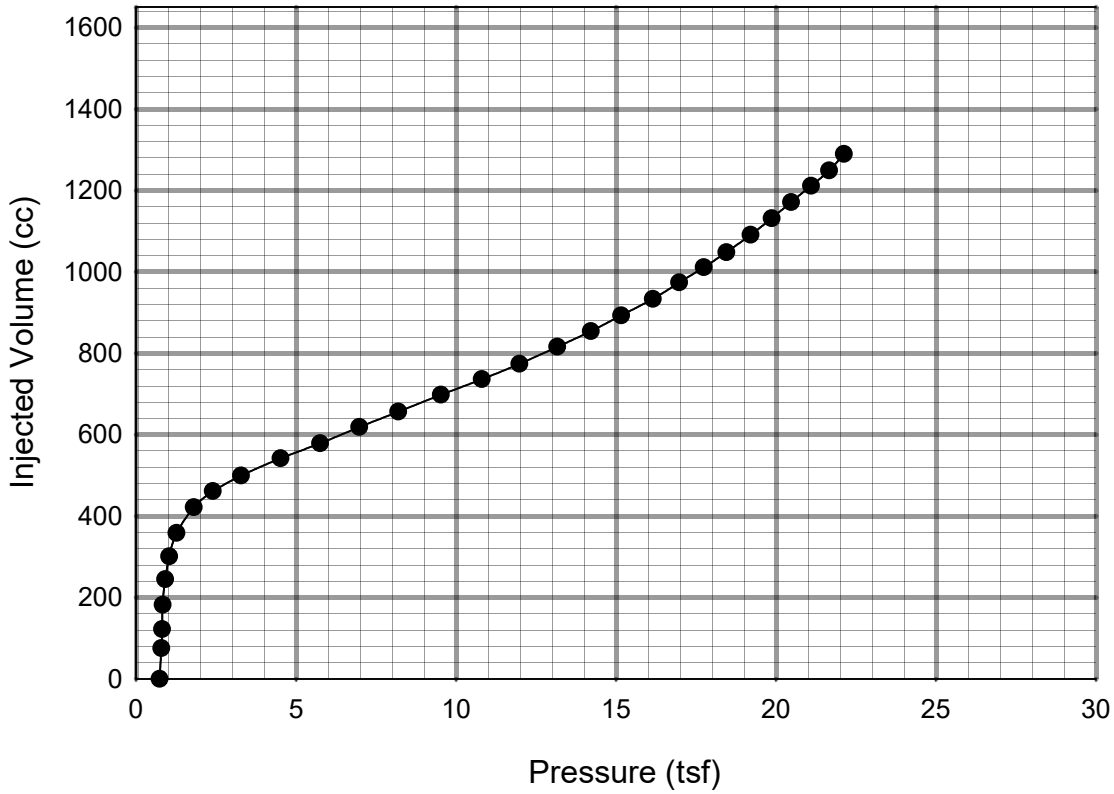
Pressuremeter Modulus (Ed): 143 tsf

DocuSign Envelope ID: 530263C8-1B38-4994-9E74-CDB4C30D6840

Pressuremeter Test Results

Project Name: Traverse City West End Parking Structure
Project Location: Traverse City, Michigan
SME Project No.: 093377.00
Test Date: September 19, 2023

Boring No.: Adjacent to B6
Test Depth: 23-25 feet
Soil Description: Fine to Medium SAND- Brown- Wet - Very Dense
Standard Penetration Test Blow Counts: 11-19-21-22
USCS Symbol: SP



Initial Pressure (Pi): 2.4 tsf

Yield Pressure (Pf): 17.0 tsf

Limit Pressure (Pl): 30 tsf

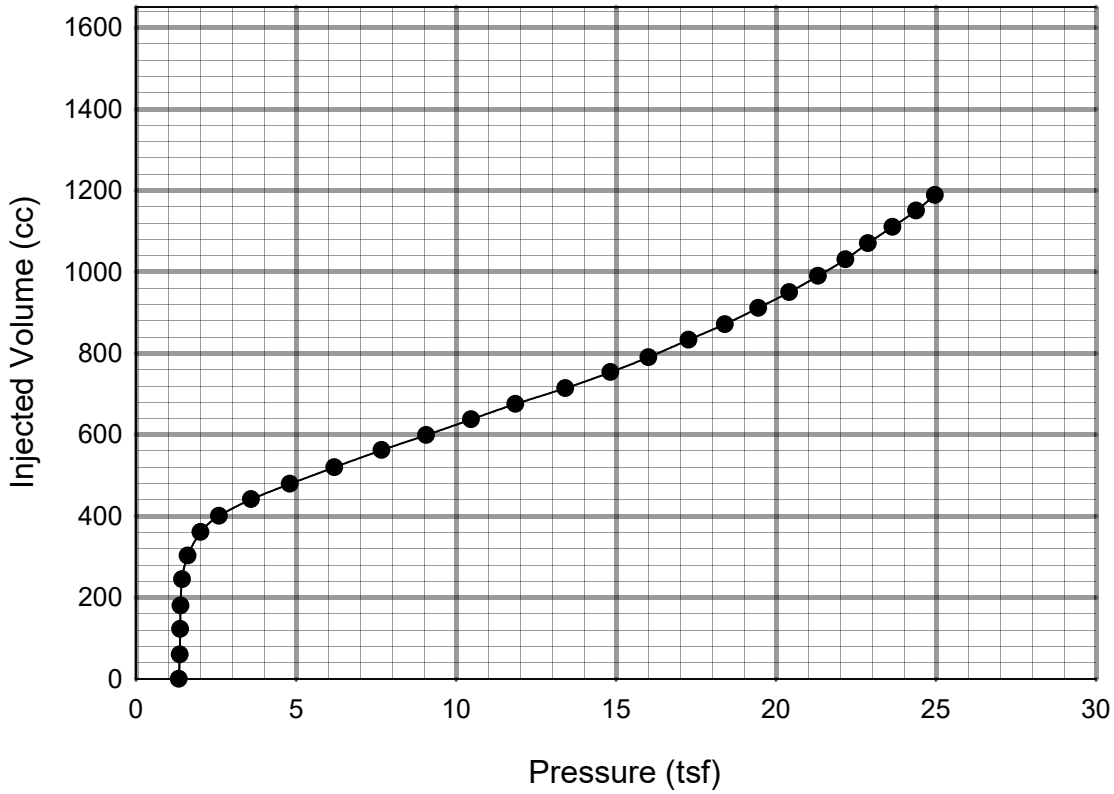
Pressuremeter Modulus (Ed): 177 tsf

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Pressuremeter Test Results

Project Name: Traverse City West End Parking Structure
Project Location: Traverse City, Michigan
SME Project No.: 093377.00
Test Date: September 19, 2023

Boring No.: Adjacent to B6
Test Depth: 38-40 feet
Soil Description: Fine to Medium SAND- Brown- Wet - Very Dense
Standard Penetration Test Blow Counts: 12-23-26-27
USCS Symbol: SP



Initial Pressure (Pi): 3.6 tsf

Yield Pressure (Pf): 17.3 tsf

Limit Pressure (Pl): Could not be determined

Pressuremeter Modulus (Ed): 210 tsf

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APPENDIX B

IMPORTANT INFORMATION ABOUT THIS GEOTECHNICAL-ENGINEERING REPORT
GENERAL COMMENTS
LABORATORY TESTING PROCEDURES

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Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, you can benefit from a lowered exposure to problems associated with subsurface conditions at project sites and development of them that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed herein, contact your GBA-member geotechnical engineer. Active engagement in GBA exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Understand the Geotechnical-Engineering Services Provided for this Report

Geotechnical-engineering services typically include the planning, collection, interpretation, and analysis of exploratory data from widely spaced borings and/or test pits. Field data are combined with results from laboratory tests of soil and rock samples obtained from field exploration (if applicable), observations made during site reconnaissance, and historical information to form one or more models of the expected subsurface conditions beneath the site. Local geology and alterations of the site surface and subsurface by previous and proposed construction are also important considerations. Geotechnical engineers apply their engineering training, experience, and judgment to adapt the requirements of the prospective project to the subsurface model(s). Estimates are made of the subsurface conditions that will likely be exposed during construction as well as the expected performance of foundations and other structures being planned and/or affected by construction activities.

The culmination of these geotechnical-engineering services is typically a geotechnical-engineering report providing the data obtained, a discussion of the subsurface model(s), the engineering and geologic engineering assessments and analyses made, and the recommendations developed to satisfy the given requirements of the project. These reports may be titled investigations, explorations, studies, assessments, or evaluations. Regardless of the title used, the geotechnical-engineering report is an engineering interpretation of the subsurface conditions within the context of the project and does not represent a close examination, systematic inquiry, or thorough investigation of all site and subsurface conditions.

Geotechnical-Engineering Services are Performed for Specific Purposes, Persons, and Projects, and At Specific Times

Geotechnical engineers structure their services to meet the specific needs, goals, and risk management preferences of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client.

Likewise, geotechnical-engineering services are performed for a specific project and purpose. For example, it is unlikely that a geotechnical-engineering study for a refrigerated warehouse will be the same as one prepared for a parking garage; and a few borings drilled during a preliminary study to evaluate site feasibility will not be adequate to develop geotechnical design recommendations for the project.

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project or purpose;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, the reliability of a geotechnical-engineering report can be affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying the recommendations in it. A minor amount of additional testing or analysis after the passage of time – if any is required at all – could prevent major problems.

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read the report in its entirety. Do not rely on an executive summary. Do not read selective elements only. *Read and refer to the report in full.*

You Need to Inform Your Geotechnical Engineer About Change

Your geotechnical engineer considered unique, project-specific factors when developing the scope of study behind this report and developing the confirmation-dependent recommendations the report conveys. Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the elevation, configuration, location, orientation, function or weight of the proposed structure and the desired performance criteria;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project or site changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept*

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responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface using various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing is performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgement to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team through project completion to obtain informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, they are <u>not</u> final, because the geotechnical engineer who developed them relied heavily on judgement and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* exposed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a continuing member of the design team, to:

- confer with other design-team members;
- help develop specifications;
- review pertinent elements of other design professionals' plans and specifications; and
- be available whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction-phase observations.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for information purposes only.* To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. This happens in part because soil and rock on project sites are typically heterogeneous and not manufactured materials with well-defined engineering properties like steel and concrete. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are <u>Not</u> Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually provide environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures.* If you have not obtained your own environmental information about the project site, ask your geotechnical consultant for a recommendation on how to find environmental risk-management guidance.

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, the engineer's services were not designed, conducted, or intended to prevent migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, ***proper implementation of the geotechnical engineer's recommendations will <u>not</u> of itself be sufficient to prevent moisture infiltration. Confront the risk of moisture infiltration*** by including building-envelope or mold specialists on the design team. ***Geotechnical engineers are <u>not</u> building-envelope or mold specialists.***

GEOPROFESSIONAL BUSINESS ASSOCIATION

Telephone: 301/565-2733
e-mail: info@geoprofessional.org www.geoprofessional.org

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GENERAL COMMENTS

BASIS OF GEOTECHNICAL REPORT

This report has been prepared in accordance with generally accepted geotechnical engineering practices to assist in the design and/or evaluation of this project. If the project plans, design criteria, and other project information referenced in this report and utilized by SME to prepare our recommendations are changed, the conclusions and recommendations contained in this report are not considered valid unless the changes are reviewed, and the conclusions and recommendations of this report are modified or approved in writing by our office.

The discussions and recommendations submitted in this report are based on the available project information, described in this report, and the geotechnical data obtained from the field exploration at the locations indicated in the report. Variations in the soil and groundwater conditions commonly occur between or away from sampling locations. The nature and extent of the variations may not become evident until the time of construction. If significant variations are observed during construction, SME should be contacted to reevaluate the recommendations of this report. SME should be retained to continue our services through construction to observe and evaluate the actual subsurface conditions relative to the recommendations made in this report.

In the process of obtaining and testing samples and preparing this report, procedures are followed that represent reasonable and accepted practice in the field of soil and foundation engineering. Specifically, field logs are prepared during the field exploration that describe field occurrences, sampling locations, and other information. Samples obtained in the field are frequently subjected to additional testing and reclassification in the laboratory and differences may exist between the field logs and the report logs. The engineer preparing the report reviews the field logs, laboratory classifications, and test data and then prepares the report logs. Our recommendations are based on the contents of the report logs and the information contained therein.

REVIEW OF DESIGN DETAILS, PLANS, AND SPECIFICATIONS

SME should be retained to review the design details, project plans, and specifications to verify those documents are consistent with the recommendations contained in this report.

REVIEW OF REPORT INFORMATION WITH PROJECT TEAM

Implementation of our recommendations may affect the design, construction, and performance of the proposed improvements, along with the potential inherent risks involved with the proposed construction. The client and key members of the design team, including SME, should discuss the issues covered in this report so that the issues are understood and applied in a manner consistent with the owner's budget, tolerance of risk, and expectations for performance and maintenance.

FIELD VERIFICATION OF GEOTECHNICAL CONDITIONS

SME should be retained to verify the recommendations of this report are properly implemented during construction. This may avoid misinterpretation of our recommendations by other parties and will allow us to review and modify our recommendations if variations in the site subsurface conditions are encountered.

PROJECT INFORMATION FOR CONTRACTOR

This report and any future addenda or other reports regarding this site should be made available to prospective contractors prior to submitting their proposals for their information only and to supply them with facts relative to the subsurface evaluation and laboratory test results. If the selected contractor encounters subsurface conditions during construction, which differ from those presented in this report, the contractor should promptly describe the nature and extent of the differing conditions in writing and SME should be notified so that we can verify those conditions. The construction contract should include provisions for dealing with differing conditions and contingency funds should be reserved for potential problems during earthwork and foundation construction. We would be pleased to assist you in developing the contract provisions based on our experience.

The contractor should be prepared to handle environmental conditions encountered at this site, which may affect the excavation, removal, or disposal of soil; dewatering of excavations; and health and safety of workers. Any Environmental Assessment reports prepared for this site should be made available for review by bidders and the successful contractor.

THIRD PARTY RELIANCE/REUSE OF THIS REPORT

This report has been prepared solely for the use of our Client for the project specifically described in this report. This report cannot be relied upon by other parties not involved in the project, unless specifically allowed by SME in writing. SME also is not responsible for the interpretation by other parties of the geotechnical data and the recommendations provided herein.

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LABORATORY TESTING PROCEDURES

VISUAL ENGINEERING CLASSIFICATION

Visual classification was performed on recovered samples. The appended General Notes and Unified Soil Classification System (USCS) sheets include a brief summary of the general method used visually classify the soil and assign an appropriate USCS group symbol. The estimated group symbol, according to the USCS, is shown in parentheses following the textural description of the various strata on the boring logs appended to this report. The soil descriptions developed from visual classifications are sometimes modified to reflect the results of laboratory testing.

MOISTURE CONTENT

Moisture content tests were performed by weighing samples from the field at their in-situ moisture condition. These samples were then dried at a constant temperature (approximately 110º C) overnight in an oven. After drying, the samples were weighed to determine the dry weight of the sample and the weight of the water that was expelled during drying. The moisture content of the specimen is expressed as a percent and is the weight of the water compared to the dry weight of the specimen.

HAND PENETROMETER TESTS

In the hand penetrometer test, the unconfined compressive strength of a cohesive soil sample is estimated by measuring the resistance of the sample to the penetration of a small calibrated, spring-loaded cylinder. The maximum capacity of the penetrometer is 4.5 tons per square-foot (tsf). Theoretically, the undrained shear strength of the cohesive sample is one-half the unconfined compressive strength. The undrained shear strength (based on the hand penetrometer test) presented on the boring logs is reported in units of kips per square-foot (ksf).

TORVANE SHEAR TESTS

In the Torvane test, the shear strength of a low strength, cohesive soil sample is estimated by measuring the resistance of the sample to a torque applied through vanes inserted into the sample. The undrained shear strength of the samples is measured from the maximum torque required to shear the sample and is reported in units of kips per square-foot (ksf).

LOSS-ON-IGNITION (ORGANIC CONTENT) TESTS

Loss-on-ignition (LOI) tests are conducted by first weighing the sample and then heating the sample to dry the moisture from the sample (in the same manner as determining the moisture content of the soil). The sample is then re-weighed to determine the dry weight and then heated for 4 hours in a muffle furnace at a high temperature (approximately 440º C). After cooling, the sample is re-weighed to calculate the amount of ash remaining, which in turn is used to determine the amount of organic matter burned from the original dry sample. The organic matter content of the specimen is expressed as a percent compared to the dry weight of the sample.

ATTERBERG LIMITS TESTS

Atterberg limits tests consist of two components. The plastic limit of a cohesive sample is determined by rolling the sample into a thread and the plastic limit is the moisture content where a 1/8-inch thread begins to crumble. The liquid limit is determined by placing a ½-inch thick soil pat into the liquid limits cup and using a grooving tool to divide the soil pat in half. The cup is then tapped on the base of the liquid limits device using a crank handle. The number of drops of the cup to close the gap formed by the grooving tool ½ inch is recorded along with the corresponding moisture content of the sample. This procedure is repeated several times at different moisture contents and a graph of moisture content and the corresponding number of blows is plotted. The liquid limit is defined as the moisture content at a nominal 25 drops of the cup. From this test, the plasticity index can be determined by subtracting the plastic limit from the liquid limit.

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Appendix 3

Stormwater Design Narrative

Traverse City / West End Parking Structure

City of Traverse City

Project No. 231082
March 20, 2024

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Traverse City / West End Parking Structure Stormwater Summary

City of Traverse City

Prepared For:
Traverse City Township Engineer
Grand Traverse County, Michigan

March 20, 2024
Project No. 231082

Final

List of Attachments

Attachment 1 – Proposed Site Stormwater Storage Calculations
- See Traverse City Ground-Water Protection and Storm-Water Control Ordinance
- See Grand Traverse County Storm Water Management Ordinance

Attachment 2 – Proposed Site Stormwater Storage Calculations
- See rational method spreadsheet (6,743 cubic feet required)
- See LGROW summary sheet (8,881 cubic feet required)
- See MC-7200 Stormtech Detail Sheet for provided volume references

List of Abbreviations/Acronyms

BMP	Best Management Practices
cfs	Cubic Feet per Second
GIS	Geographic Information System
LGROW	Lower Grand River Organization of Watersheds
TSS	Total Suspended Solids
USGS	U.S. Geological Survey
HWL	High Water Line

1.0 Underground Detention System

1.1 Site Conditions

Developed Conditions

- The tributary area of the proposed underground detention system includes three roofs: the parking structure (30912 SF), the AB building (4410SF), and the Liner building (10420 SF).
- Total Contributing Drainage Area of 1.05 AC with a weighted runoff coefficient value of 0.90.

Undeveloped Conditions

- The undeveloped condition of the tributary area was assumed to be Meadow.
- Considering infiltration testing provided present values of 38 inches / hour, the undeveloped condition was assumed be exclusively hydrological soil group A soils.

1.2 Design Standards

Water Quality Storage Requirement

- 2.5 inches of rain over all impervious surfaces
- Attachment 1.1, Page 2, Point 9

Flood Control Storage Requirement

- Facilities shall be designed to pass a 10-year storm event.
- Attachment 1.1, Page 2, Point 9

First Flush Storage Requirement

- Retain or allow infiltration of the first 0.5 inches of runoff.
- Attachment 1.1, Page 2, Point 10

Minimum Detention Requirement

- When a downstream outlet is unacceptable, detention, retention , and infiltration facilities shall have capacity to hold the increase in runoff volume generated by the earth changed. This calculation shall compare the undeveloped condition to the developed condition for a 25-year 24-hour storm event.
- Attachment 1.1, Page 2, Point 8

Maximum Allowable Infiltration Rate

- The lesser of 4 inches per hour or 0.5 times the measured infiltration rate
- Attachment 1.2, Page 19, Point 2.3.3 3C

System Elevation compared to Groundwater

- Bottom of the system must be at least 4 feet above the high groundwater table.
- Attachment 1.2, Page 23, Point 2.3.5 D

1.3 Preliminary Storage Design

Preliminary Spreadsheet Inputs

- Contributing Area = 1.05 ac (section 1.1)
- Weighted Runoff Coefficient = 0.90 (roof)
- Release Rate = 0 cfs (desire from city to achieve 100% infiltration)
- Infiltration Rate = 4 in/hr (lesser between 4 and 19)

Infiltration / System Area

- The foundation plan was first analyzed to identify the available space for the detention system. Using project 211281 as a reference, the largest footing dimension was assumed to be 11.25' x 11.25' measured from the center of the column. To provide adaquate construction space, a buffer of 15' measured from all footings was implemented. This resulted in a 74' X 30' usable footprint in the northwest corner of the structure. If size becomes a constraint as calculations are completed, more length is available in the southwest corner as neccesary.
- The Stormtech MC-7200 chamber was selected and used throughout the following calculations.
    - Unit Width: 100" per unit, minimum 9" buffer between units, minimum 12" buffer at both ends.
        - A three-row system was selected based on the allotted width of 30' and the minimum width requirements shown in the table below.

Number of Rows	Minimum Width
2	19.42'
3	28.50'
4	37.58'

    - Unit Legnth: 79.1" per unit, 32.8" end caps, 48" buffer on ends for inlet and outlet manifolds.
    - Unit Storage: Minimum storage of 267.3 and 115.3 CF per chamber and end cap respectively
        - Minimum storage calculations assume 12" stone above the system, 9" stone foundation, 9" of stone between chambers, 12" stone perimeter, and 40% stone porosity.
        - 9 units per row was tentatively selected as it minimizes the number of units required while adhering to the volume and length requirements for the site.

Units per Row	Minimum Legnth	Infiltration Area	Volume Provided	Volume Required
7	59.61'	51.61' * 28.5' = 1470.9 SF	5843.9 CF	7244 CF
8	66.20'	58.20' * 28.5' = 1658.7 SF	6645.8 CF	6993 CF
9	72.79'	64.79' * 28.5' = 1846.5 SF	7447.7 CF	6743 CF

1.4 LGROW Storage Design

Proposed Detention Volume Analysis

The LGROW spreadsheet was used to validate the proposed volume of 7447 CF associated with the 3x9 unit layout. This was accomplished by modeling the underground detention basis as an infiltration structural BMP with the following parameters.

- Undeveloped Runoff Calculation Summary
  - Initial abstraction (Ia) = 4.667in, 25-year, 24-hour Rainfall (P) = 4.56in
  - SRO = 0in (Ia >P, SCS method)
  - Undeveloped Runoff Volume = 0 CF
- Developed Runoff Calculation Summary
  - Initial abstraction (Ia) = 0.041in, 25-year, 24-hour Rainfall (P) = 4.56in
  - SRO =4.42in (Ia<P, SCS method)
  - Developed Runoff Volume = 16,863 CF
- Summary of Volumes
  - Provided storage volume = 7448 CF
  - Provided Infiltrating Volume = 6075 CF
    - Infiltration Rate = 4 in/hour
    - Infiltration Area = 1847 SF
    - Infiltration Time = 9.9 hours based on Hortons infiltration model
  - Unretained Runoff Volume = 3340 CF

In summary, the LGROW spreadsheet concluded that the preliminary pond size was undersized by 3340 CF. This discrepancy was caused by the first model neglecting the diminishing efficacy of infiltration with time and the difference in calculation method (rational versus SCS).

Adjusted Detention Volume via LGROW

Using LGROW as the primary design tool, larger unit layouts were further analyzed as summarized in the table below. The volume required column was derived using the following:

- Developed Runoff – Undeveloped Runoff – Infiltration Volume

Units per Row	Minimum Legnth	Infiltration Area	Volume Provided	Volume Required
10	79.38’	71.38’ * 28.5’ = 2034.4 SF	8249.6 CF	10,151.6 CF
11	85.97’	77.97’ * 28.5’ = 2222.1 SF	9051.5 CF	9516.5 CF
12	92.56	84.56’ * 28.5’ =2409.9 SF	9853.4 CF	8881.0 CF

With these values in mind, a 3x12 unit layout was ultimately selected, providing a total volume of 17836 CF split between 9853 CF of storage volume and 7982 CF of infiltrating volume. This value is greater than the 16,863 CF of runoff generated between the undeveloped and developed conditions when analyzing the 25-year, 24-hour storm event.

Appendix 4

Traffic Impact Study

Traverse City West End Parking Structure Traffic Impact Study

Project No. 231082
January 19, 2024

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Traverse City West End Parking Structure
Traffic Impact Study

Prepared For:
The City of Traverse City
Traverse City, Michigan

January 19, 2024
Project No. 231082

Table of Contents

Executive Summary 1

1.0 Introduction 1
- 1.1 Project Overview 1
- 1.2 Study Methodology 2

2.0 Study Area Characteristics 3
- 2.1 Intersection Characteristics 3
- 2.2 Baseline Traffic Volumes 4
- 2.3 Roadway Characteristics 6
- 2.4 Multimodal Characteristics 7

3.0 Existing and Background Conditions Analysis 12
- 3.1 Traffic Operations Analysis Methodology 12
- 3.2 Background (No-Build) Conditions 12
- 3.3 Two-Way Operations 13
- 3.4 One-Way Operations 14

4.0 Site Traffic Characteristics 15
- 4.1 Parking Structure 15
- 4.2 Proposed Site Traffic 16
- 4.3 Trip Distribution 17
- 4.4 Trip Assignment 17

5.0 Build Conditions Analysis 22
- 5.1 Two-Way Traffic Operations 22
  - 5.1.1 Future Conditions 22
  - 5.1.2 Future Improvement Conditions 23
- 5.2 One-Way Operations 26
  - 5.2.1 Future Conditions 26
  - 5.2.2 Future Improvement Conditions 27
- 5.3 Two-Way and One-Way Comparison 28

6.0 Findings and Recommendations 28

List of Figures

Figure 1 – Project Location and Study Network 2
Figure 2 – Two-Way Lane Configurations 8
Figure 3 – One-Way Lane Configurations 9
Figure 4 – Two-Way Baseline Traffic Volumes 10
Figure 5 – One-Way Baseline Traffic Volumes 11
Figure 6 – Conceptual Site Plan (not to scale) 16
Figure 7 – Two-Way Trip Generation Volumes 18
Figure 8 – One-Way Trip Generation Volumes 19
Figure 9 – Two-Way Future Traffic Volumes 20
Figure 10 – One-Way Future Traffic Volumes 21
Figure 11 – Union Steet and State Street Proposed Lane Configuration (Two-Way Traffic Operations) 30
Figure 12 – Front Street and Pine Street Proposed Lane Configuration (Two-Way Traffic Operations) 30

List of Tables

Table 1 – Available AADT Volumes....7
Table 2 – LOS Criteria....12
Table 3 – LOS Analysis for Background Conditions Two-Way Operations....13
Table 4 – LOS Analysis for Background Conditions One-Way Operations....14
Table 5 – Trip Generation....17
Table 6 – Trip Distribution....17
Table 7 – LOS Analysis for Future Conditions Two-Way Operations....22
Table 8 – LOS Analysis for Future Conditions Two-Way Operations....24
Table 9 – LOS Analysis for Future Conditions One-Way Operations....26
Table 10 – LOS Analysis for Future Improvement Conditions One-Way Operations....27
Table 11 – Two-Way vs. One-Way Comparison....28

List of Appendices

Appendix 1 – Traffic Count Data
Appendix 2 – Two-Way Operations Background LOS Output Reports
Appendix 3 – One-Way Operations Background LOS Output Reports
Appendix 4 – Two-Way Operations Future LOS Output Reports
Appendix 5 – Two-Way Operations Future Improvement LOS Output Reports
Appendix 6 – One-Way Operations Future LOS Output Reports
Appendix 7 – One-Way Operations Future Improvement LOS Output Reports

List of Abbreviations/Acronyms

AADT	Average Annual Daily Traffic
BATA	Bay Area Transportation Authority
City	City of Traverse City
DDA	Downtown Development Authority
EB	eastbound
ETCDG	Electronic Traffic Control Device Guidelines (MDOT)
HCM	Highway Capacity Manual
ITE	Institute of Transportation Engineers
LOS	Level of Service
MDOT	Michigan Department of Transportation
mph	miles per hour
NB	northbound
PAE	Progressive AE
SB	southbound
TDMS	Transportation Data Management System
TIS	Traffic Impact Study
TMC	Turning Movement Count
WB	westbound
vpd	vehicles per day

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Executive Summary

The City of Traverse City (City) is proposing to build a new parking structure on the west end of downtown. This proposed West End Parking Structure is the third structure to be developed in downtown. This report outlines the analyses, findings, and recommendations of a Traffic Impact Study (TIS) completed for the parking structure. The TIS was performed at the City's request to evaluate the potential traffic-related impacts of the parking structure.

The West End Parking Structure will be constructed along the north side of State Street between Pine and Union Streets. Access to the structure will be provided from the alley that connects Pine Street and Union Street on the north side of the proposed structure via a single driveway. On the south side of the parking structure along W State Street, there will be first floor retail/commercial space and residential on the remaining floors. The proposed parking structure will be built in one phase expected to open in 2026 and will provide approximately 530 parking spaces.

The City and Downtown Development Authority (DDA) previously commissioned a study to examine the feasibility of converting several roadways within downtown from one-way traffic flow to two-way traffic flow, with the associated roadway modifications being completed in November 2022. These alterations involved the conversion of sections of Pine Street, State Street, and Boardman Avenue from one-way to two-way traffic operations and applicable pavement marking, signage, and signal modifications. These roadway modifications are currently in an evaluation phase, and the potential of converting the streets back to one-way operations is still a possibility. The City has therefore requested that traffic analysis for the proposed parking structure should be completed for both one-way and two-way traffic operations.

This study was conducted according to the methodologies and guidance published by the Institute of Transportation Engineers (ITE). The study scope was developed through communication with the City and DDA. Key assumptions were vetted with the City via email and phone throughout the study process. The study network includes the following intersections:

- Union Street and Front Street (pretimed traffic signal).
- Union Street and State Street (pretimed traffic signal).
- Pine Street and Front Street (atypical NB/WB stop-control).
- Pine Street and Alley (minor approach WB stop-control).
- Union Street and Alley (minor approaches EB/WB stop-control).

Existing or "baseline" conditions for this study were established based on existing intersection turning movement counts (TMCs) that were provided by the City for use in this study. This area has been studied in the recent years in association with the one-way to two-way conversion; therefore, multiple data points were available. Typically, the highest volume for each movement was utilized in this study. Volume adjustments and balancing was then completed to establish the two-way baseline conditions and the one-way baseline conditions. Signal timing information was obtained from the City. The existing intersection and roadway lane configurations, geometry, and traffic control were determined based on field observations, available aerial imagery, and available street level imagery.

Capacity analyses were conducted based on Highway Capacity Manual (HCM) methodologies using Synchro traffic analysis software. Synchro network models were also simulated using SimTraffic to evaluate network operations including intersection queueing. Analyses were conducted to represent the typical weekday morning (7:00 to 9:00 a.m.) and evening (4:00 to 6:00 p.m.) peak periods. The analysis of Background 2026 traffic conditions indicate that no operational improvements are necessary to mitigate any unacceptable traffic conditions absent of the proposed parking structure. However, there are several locations that the City should continue to monitor.

Regardless of the proposed project:

- Union Street (both one-way and two-way conditions):
  - Evaluate leading protected/permitted left turn phasing to clear left turn queues and allow thru traffic to progress at all studied intersections on Union Street. Introducing left turn phasing may interrupt signal coordination which is beyond the scope of this study network and such implications should be evaluated on a broader scale.
- Union Street and State Street (two-way conditions):
  - The EB approach currently operates with a shared left/thru/right lane. Left turning vehicles can cause significant backups while waiting for a gap in oncoming traffic to complete their movement. If these queueing issues become excessive, an EB left turn lane should be constructed.
- Front Street and Pine Street (two-way conditions):
  - The WB approach currently operates with a shared left/thru lane. The intersection currently has stop-control on the NB and WB approaches. WB left turning vehicles can cause significant backups while waiting for a gap in EB traffic to complete their movement. If these queueing issues become excessive, the WB approach should be reconfigured to separate left and thru traffic lanes. Alternative traffic control such as minor stop control, all-way stop control, or signalization (as warranted) should also be considered.

Future conditions capacity and queueing analyses show that with the addition of the parking structure traffic, the study intersections would require improvements to operate acceptably under either two-way or one-way operations within downtown Traverse City. Although one-way conditions may indicate lesser overall intersection delays, limited access provided by one-way flows can concentrate volumes on critical movements and increase vehicle miles travelled. The decision to retain two-way operations or revert to one-way operations must consider additional pros and cons that are beyond the purview of this study.

The analyses conducted for this TIS indicate that the proposed parking structure will not create new impacts to the adjacent road network. The consolidation of parking demand to a single location will, however, exacerbate existing capacity deficiencies both under one-way and two-way conditions. The extent of feasible improvements necessary to facilitate the concentration of parking from surface lots to a new parking structure were identified based on the results of the operational analyses as well as the following considerations:

- Existing turn lane storage lengths are constrained by buildings, on-street parking, and sidewalk. These relatively short storage lengths are periodically exceeded with or without this project. Generally, extensive reconstruction and/or the loss of parking spaces are not warranted to extend these storage lengths.
- Existing nor planned transit or non-motorized facilities in the site vicinity would not be significantly impacted by the project. More extensive vehicular capacity improvements would tend to degrade the pedestrian environment by lengthening pedestrian crossing distances and increasing vehicle speeds.

In summary, the following are recommended to facilitate the new parking structure and improve operations for all network users.

With the proposed project under Two-Way Traffic Conditions:

- Union Street and State Street:
  - Construct an EB left turn lane with a minimum of 100’ of storage.
- Front Street and Pine Street:
  - Reconfigure the WB approach to allow for separation of WB left turning traffic and WB thru traffic. This will require advanced signing along Front Street to inform drivers of the left-hand lane drop at Pine Street.
- Union Street and Alley:
  - Consider a left turn prohibition from the alley onto NB Union Street.

With the proposed project under One-Way Traffic Conditions:

- Union Street and Front Street:
  - Protected left turn phasing on Union Street becomes critical for the NB left turn to Front Street with the proposed parking structure. Consider leading protected/permitted left turn phasing to clear left turn queue and allow thru traffic to clear the intersection.
- Union Street and Alley:
  - Consider a left turn prohibition from the alley onto NB Union Street.

The opinions, findings, and conclusions expressed in this TIS are those of Fishbeck and not necessarily those of the Owner/Applicant, the City of Traverse City, or the Traverse City Downtown Development Authority.

Prepared By:

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1.0 Introduction

1.1 Project Overview

The City of Traverse City (City) is proposing to build a new parking structure on the west end of downtown. The City's long-term parking vision includes consolidating parking into three structures to reduce surface parking while providing parking supply to meet downtown's diverse needs. This proposed West End Parking Structure is the third structure to be developed in downtown and will consolidate the west end parking supply, help support future downtown development, and encourage new housing projects on or near the redevelopment site. The project is also expected to meet the City's Downtown Development Authority (DDA) goal of improving the downtown pedestrian experience by removing existing surface lots.

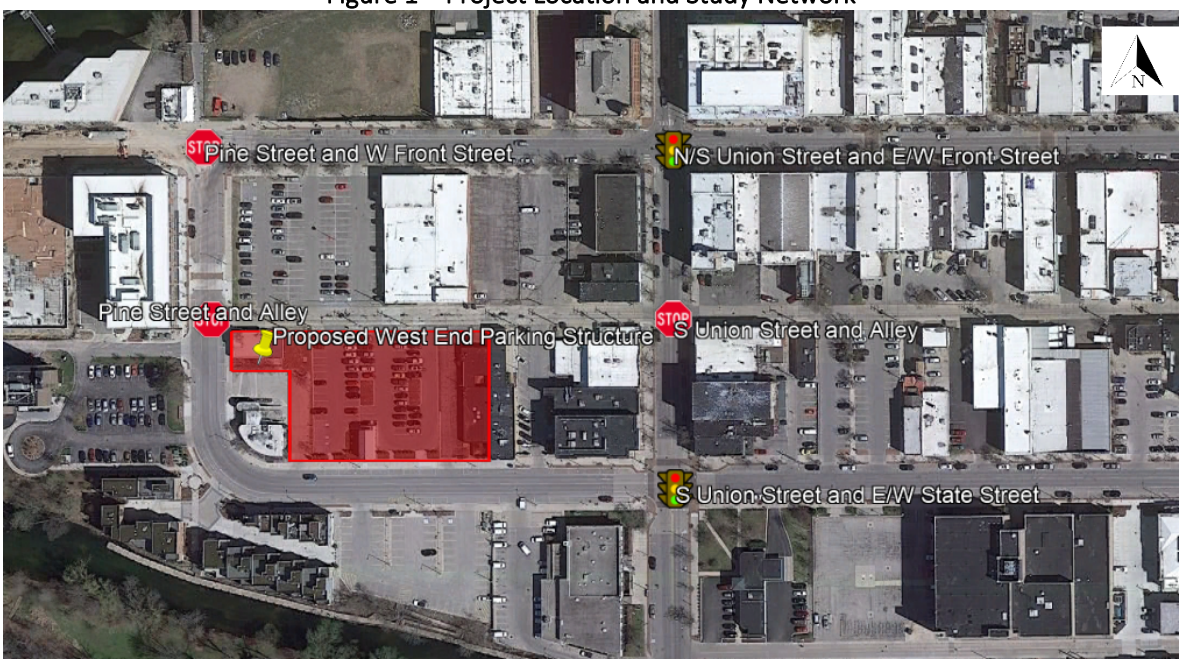
Consolidation of parking supply from surface lots to a single parking structure will in turn consolidate traffic demands and impact traffic patterns. This traffic study was completed to evaluate expected changes in traffic operations and the adequacy of existing roadway infrastructure to accommodate these changes. The results of the traffic study are intended to support the parking structure design and inform decision makers as to associated roadway and traffic control modifications required to facilitate the project.

The DDA previously commissioned a study to examine the feasibility of converting several roadways within downtown from one-way traffic flow to two-way traffic flow. Progressive AE (PAE) completed this study in April 2022, and the City and DDA installed the associated roadway modifications in November 2022. These alterations involved the conversion of sections of Pine Street, State Street, and Boardman Avenue from one-way to two-way traffic operations and applicable pavement marking, signage, and signal modifications. These roadway modifications are currently in an evaluation phase, and the potential of converting the streets back to one-way operations is still a possibility. The City has therefore requested that traffic analysis for the proposed parking structure should be completed for both one-way and two-way traffic operations.

The West End Parking Structure will be constructed along the north side of State Street between Pine and Union Streets. Access to the structure will be provided from the alley that connects Pine Street and Union Street on the north side of the proposed structure via a single driveway. On the south side of the parking structure along W State Street, there will be first floor retail/commercial space and residential on the remaining floors. The proposed parking structure will be built in one phase expected to open in 2026 and will provide approximately 530 parking spaces. On behalf of the City, Fishbeck has conducted this Traffic Impact Study (TIS) to evaluate the potential traffic-related impacts of the parking structure. The scope of this TIS includes the block surrounding the subject site (bounded by Front Street, Pine Street, State Street, and Union Street) including key intersections and proposed access.

The study network was modeled and analyzed with and without the proposed parking structure. This was done for both one-way and two-way operations on Pine and State Streets. Operational results for the no-build and build conditions support recommendations for any necessary mitigation measures. The project location and study intersections are indicated in Figure 1 – Project Location and Study Network.

Figure 1 – Project Location and Study Network



1.2 Study Methodology

The key objectives of this study were to determine what impacts the proposed project will have on adjacent roadway traffic operations and analyze access for the proposed parking structure. Subsequently these findings were used to develop recommendations for any improvements necessary to mitigate the project impacts on external intersections as well as site access design. Study analyses were completed relative to typical weekday morning and afternoon peak periods. Operational analyses and future traffic forecasts were completed for two-way and one-way traffic flows on Pine and State Streets. The following sections of this report include:

- Detailed descriptions of the study area roadways and intersections.
- Existing traffic volumes based on Summer 2021 counts, Summer 2023 counts, and adjustments to account for the potential impacts of the Union Street and Cass Street Bridge closures.
- Description of other proposed developments in the area (if applicable).
- Background (no-build) conditions analysis for the Opening Year (2026).
- Descriptions of the proposed parking site options and proposed access.
- Trip generation and distribution for the project.
- Build conditions analysis for the Opening Year (2026).
- Recommended improvements necessary to mitigate project impacts.

This document represents a summation of methodologies, analyses, findings, and recommendations (described in greater detail in subsequent sections) of this traffic study. This study was conducted according to the methodologies and guidance published by the Institute of Transportation Engineers (ITE). The study scope was developed through communication with the City and DDA. Key assumptions were vetted with the City via email and phone throughout the study process.

Data Collection – A field reconnaissance of the study area was conducted to determine the physical and operational characteristics of the roadway network including lane configurations and traffic control, in combination with review of recent aerial imagery. Weekday peak period turning movement counts were provided by the City for use in this study. These counts were taken at the study intersections using MioVision Scout cameras and Jamar radar units in association with the one-way/two-way study evaluation. Counts at key

intersections were supplemented by data collected by the City and processed by Fishbeck at the adjacent alley intersections. Other information used in the analysis was obtained by request from local agencies, or from available online traffic information databases.

For the purposes of this study, "baseline" conditions will refer to the traffic volumes, lane configurations, and traffic control that exist or will exist in the immediate future, regardless of the proposed project.

Site Traffic Characteristics – The forecasted increase in traffic that will be generated by the proposed parking structure was determined based on the projected parking capacity, expected mix of users, and average service rates. Forecasting trips associated with the proposed parking structure was coordinated with the City. Estimated parking turnover rates were applied to estimate peak hour traffic volume increases. Estimated new peak hour site trips were added to the proposed Opening Year background traffic across the study network.

Evaluation and Recommendation – Background growth was added to the baseline traffic to project future traffic volumes absent of the proposed project. The peak hour trips generated by the project were then assigned to the adjacent roadways. Capacity analyses were conducted at the study intersections to determine the ability of the intersections to accommodate future traffic demands. Relative impacts of the project were identified based on comparison of no-build and build conditions. Access analyses were conducted to determine if adequate for ingress and egress is provided for the proposed parking structure with minimal queueing on the adjacent road network. Based on the analysis, recommendations were developed as necessary to mitigate the potential impacts of new traffic volumes and turning movement patterns generated by the project.

2.0 Study Area Characteristics

2.1 Intersection Characteristics

Based on the size and location of the proposed parking structure, the likely area of influence for the additional site trips, and expected new turning movement patterns, traffic operations were analyzed for the following intersections:

- Union Street and Front Street (pretimed traffic signal).
- Union Street and State Street (pretimed traffic signal).
- Pine Street and Front Street (atypical NB/WB stop-control).
- Pine Street and Alley (minor approach WB stop-control).
- Union Street and Alley (minor approaches EB/WB stop-control).

As described in the *Project Overview* section above, the City and DDA completed roadway modifications in November 2022 that involved the conversion of sections of Pine Street, State Street, and Boardman Avenue from one-way to two-way traffic operations. This involved signal modifications at the intersection of Union Street and State Street to add signal heads for the WB approach. No adjustments to signal timings were made; however, the City is monitoring this intersection to determine if adjustments to timings or laneage are required.

Additionally, changes were implemented at the intersection of Pine Street and Front Street. This intersection is the transition point between two-way operation and one-way WB operation on Front Street. Prior to the roadway modifications, Pine Street operated with one-way SB traffic flow. EB Front Street was required to turn right onto SB Pine Street utilizing the channelized right turn lane, yielding to pedestrians. WB Front Street could turn left onto southbound Pine Street utilizing the channelized left turn lane or continue straight on WB Front Street in a separate lane from left turning traffic, with both movement required to yield to pedestrians.

With the implementation of the roadway modifications, Pine Street now operates with two-way traffic. The channelized turning movements at the intersection of Pine Street and Front Street were reconstructed to accommodate this change in operations. With two-way operations on Pine Street, there is a channelized right

turn lane from EB Front Street onto SB Pine Street that operates freely (vehicle are required to yield to pedestrians). WB Front Street traffic is required to stop and can continue WB on Front Street or turn left onto SB Pine Street from a single shared lane. NB Pine Street is required to stop and must turn left onto WB Front Street.

The baseline intersection lane configurations, traffic controls, and posted speed limits for both two-way and one-way operations are indicated in Figure 2 – Two-Way Lane Configurations and Figure 3 – One-Way Lane Configurations.

2.2 Baseline Traffic Volumes

To determine the state of "baseline" traffic operations, existing intersection turning movement counts (TMCs) were provided by the City for use in this study. This area has been studied in the recent years in association with the one-way to two-way conversion by PAE; therefore, multiple data points were available. MioVision Scout cameras were stationed at each of the study intersections to collect turning movement counts and were supplemented by Jamar radar units. Data provided by the City for use in this study included the following:

- TMCs collected in July 2021 by PAE for the One-Way to Two-Way Circulation Study:
  - Union Street and Front Street;
  - Union Street and State Street; and
  - Pine Street and Front Street.
- TMCs collected in March, May, and July 2023 for monitoring the two-way conversions:
  - Union Street and Front Street;
  - Union Street and State Street; and
  - Pine Street and Front Street.
- TMCs recorded by the City and processed by Fishbeck in August 2023:
  - Union Street and Alley; and
  - Pine Street and Alley.
- Various 24-hour and ADT data provided by the City and available on the Michigan Department of Transportation (MDOT) Transportation Data Management System (TDMS) website.

Upon review of the data, Fishbeck recognized variations and investigated the potential factors that would contribute to variations in count data. Fishbeck identified the following influences:

- Data collected in 2021 reflect one-way operations on Pine Street and State Street.
- Data collected in 2023 reflect two-way operations on Pine Street and State Street.
- Data collected in 2023 was taken during the closure of the Union Street bridge over the Boardman River.

Evaluation of the 2021 versus 2023 count data revealed some turning movement patterns had shifted within the study network relative to the one-way to two-way conversions of Pine Street and State Street. Traffic volumes on Union Street were also significantly lower in 2023 than in 2021 due to the detour of traffic over the Boardman River. Based on this information, the following steps were taken to establish the Two-Way Baseline Conditions volumes for the study network:

- 2021 volumes were referenced for all network movements to/from the south due to the 2023 closure of the Union Street bridge over the Boardman River.
- 2023 volumes were referenced for all other movements at the study intersections specific to the two-way analysis scenario. The highest volume between the March/May/July 2023 counts was selected for each movement.
- The left turn volume from SB Union Street to EB State Street was carrying approximately double the volume in 2023 as compared to 2021 due to the posted detour route for the Union Street bridge closure. The volume on this movement was therefore adjusted downward with a corresponding upward adjustment to the SB thru volume.

Additionally, the following steps were taken to establish the One-Way Baseline Conditions volumes for the study network:

- 2021 volumes were referenced for all movements across the study network. To account for any ambient growth, the 2021 counts were increased by 10% for the one-way analysis only.
- The counts collected in 2023 at the two Alley intersections were referenced. At the intersection of Pine Street and Alley, the 2023 counts were adjusted to direct all traffic turning from the Alley to SB Pine Street.

Volumes were balanced upward across the study network. Given the various sources and timelines for data at each of the study intersections, some of these adjustments were significant. Therefore, these volumes were backchecked against the PAE study and historical data to ensure that the adjustments are reasonable and not overly conservative.

The following factors were considered with the stated assumptions to validate the adjusted data and establish Two-Way Baseline Conditions:

- Volumes at the intersection of Union Street and State Street received minimal balancing adjustment. Relative to the adjacent study intersections, volumes at this location were higher; therefore, this intersection acted as the set point for upward balancing towards Front Street along Union Street and State Street to Pine Street.
- Movements to/from the south were most significantly adjusted, in particular at the alley intersections with Pine Street and Union Street. The NB/SB adjusted volumes reasonably correspond to historical volumes on Union Street south of State Street.
- There are sink/source nodes (existing parking access) along Front Street, Pine Street, and State Street that likely account for a portion of the noted imbalances. Conservatively, the sink/source volumes are assumed to be equal and balancing was carried through between the study intersections.
- Utilization of the alley provides for access to parking and adjacent businesses; therefore, imbalance due to sink/source is expected and volumes EB/WB along the alley were not balanced.
- Dummy nodes were not added to the network to account for sink/source due to the previously mentioned findings. Additionally, modeling dummy nodes on this network is not desirable due to the proximity of study intersections and limitations of Synchro/SimTraffic relative to closely spaced intersections.
- No growth rate was applied to 2021 data to establish 2023 volumes in the two-way models as the upward balancing adjustments are sufficient to account for any minor ambient growth and/or potential impacts of COVID-19 on peak traffic demands.

The following factors were considered with the stated assumptions to validate the adjusted data and establish One-Way Baseline Conditions:

- The volumes collected at the Alley intersections in 2023 were balanced upward along Union Street and Pine Street.
- There are sink/source nodes (existing parking access) along Front Street, Pine Street, and State Street that likely account for a portion of the noted imbalances. Conservatively, the sink/source volumes are assumed to be equal and balancing was carried through between the study intersections.
- Utilization of the alley provides for access to parking and adjacent businesses; therefore, imbalance due to sink/source is expected and volumes EB/WB along the alley were not balanced.
- Dummy nodes were not added to the network to account for sink/source due to the above findings. Additionally, modeling dummy nodes on this network is not desirable due to the proximity of study intersections and limitations of Synchro/SimTraffic relative to closely spaced intersections.
- A growth rate of 10% was applied to 2021 data to establish 2023 volumes in the one-way models to account for any ambient growth and/or potential impacts of COVID-19 on peak traffic demands.

Baseline peak hour traffic volumes are shown in Figure 4 – Two-Way Baseline Traffic Volumes and Figure 5 – Two-Way Baseline Traffic Volumes. All traffic counts are provided in Appendix 1 – Traffic Count Data.

2.3 Roadway Characteristics

The characteristics of the study area roadways are described below:

Front Street is an east-west major collector roadway under City jurisdiction with a prima facie speed limit of 25 miles per hour (mph). The roadway is specifically called E Front Street east of Union Street and W Front Street west of Union Street. The roadway operates with two-way traffic west of Pine Street and one-way WB traffic east of Pine Street. West of Pine Street, the roadway has one lane in each direction with a bike lane, on-street parking, and curb and gutter on both sides of the roadway. East of Pine Street, the roadway has two westbound lanes, a bike lane and on-street parking on the north side of the road, and curb and gutter on both sides of the roadway.

State Street is an east-west major collector roadway under City jurisdiction with a prima facie speed limit of 25 mph. The roadway is specifically called E State Street east of Union Street and W State Street west of Union Street. Prior to the roadway modifications, State Street typically had two EB lanes, a bike lane on the south side of the roadway, and on-street parking and curb and gutter on both sides of the roadway. With the two-way conversion, State Street typically has one lane in each direction, a bike lane on the south side of the roadway, and on-street parking and curb and gutter on both sides of the roadway.

Union Street is a north-south major collector roadway under City jurisdiction with a prima facie speed limit of 25 mph. The roadway is specifically called N Union Steet north of Front Street and S Union Street south of Front Street. The roadway typically has one lane in each direction and has on-street parking and curb and gutter on both sides of the roadway. Immediately adjacent to the signalized intersections with Front Street and State Street, on-street parking is restricted to accommodate separated left turn or right turn lanes.

Pine Street is a north-south major collector roadway under City jurisdiction with a prima facie speed limit of 25 mph. Prior to the roadway modifications, the roadway typically had two SB lanes, a bike lane on the west side of the roadway and on-street parking and curb and gutter on both sides of the roadway. With the two-way conversion, the roadway typically has one lane in each direction, a bike lane on the west side of the roadway, and on-street parking and curb and gutter on both sides of the roadway. There is a midblock pedestrian crosswalk approximately 150 feet south of Front Street. There are signs on both sides of the roadway indicating that vehicles are required to stop for pedestrians in the crosswalks.

The Alley is an east-west local roadway under City jurisdiction that provides access several businesses and parking lots. The alley has one lane for each direction of travel with a prima facie speed limit of 25 mph. East of Union Street the alley operates one-way EB only.

Table 1 summarizes the most recent available Annual Average Daily Traffic (AADT) volumes on the study area roadways adjacent to the study site. No data were available for Pine Street.

Table 1 – Available AADT Volumes

Roadway	Direction	AADT (vpd*)	Year	Source
Front Street	WB	6,399	May 2023	Progressive AE Collected
State Street	EB	3,811	July 2023	City Collected
	WB	1,346		
Union Street	NB/SB	14,067	2022 (estimated)	MDOT TDMS
Alley	EB	242	August 2023	City Collected
	WB	97		

**vpd – vehicles per day*

2.4 Multimodal Characteristics

The primary transportation system user for the parking structure and within the study area is vehicular traffic. Accordingly, this study focuses on the potential impacts to the vehicle transportation network. That stated, traffic count data indicate significant pedestrian volumes at the studied intersections, especially during peak summer months. These pedestrian volumes are accounted for in the modeling and analysis of the study network.

There are multimodal and non-motorized facilities in the vicinity of the project, including signalized crosswalks. The two stud traffic signals do not have pedestrian push buttons, instead the pedestrian signals activate every cycle. There is currently sidewalk on both sides of all roadways within downtown Traverse City, except for the Alley. Additionally, there are bike lanes along the north side of Front Street, the south side of State Steet, and the west side of Pine Street. There is a midblock pedestrian crosswalk on Pine Street approximately 150 feet south of Front Street. There are signs on both sides of the roadway indicating that vehicles are required to stop for pedestrians in the crosswalks.

Bay Area Transportation Authority (BATA) is the area transit agency with bus routes existing throughout Traverse City and the surrounding area. There are three fixed route transit services (Route 01 Downtown to DT Mall, Route 02 Downtown to Goodwill Inn, and Bayline) that have stops within the study area. There are bus stops along Front Steet, State Street, and Pine Street within the study area.

The proposed project is not expected to have any adverse impact on the existing or planned transit or non-motorized facilities in the site vicinity. The project will maintain all existing sidewalk and will provide internal connections to the existing public facilities as appropriate. The proposed plan includes a midblock pedestrian crosswalk on State Street adjacent to the parking structure.

Figure 2 – Two-Way Lane Configurations

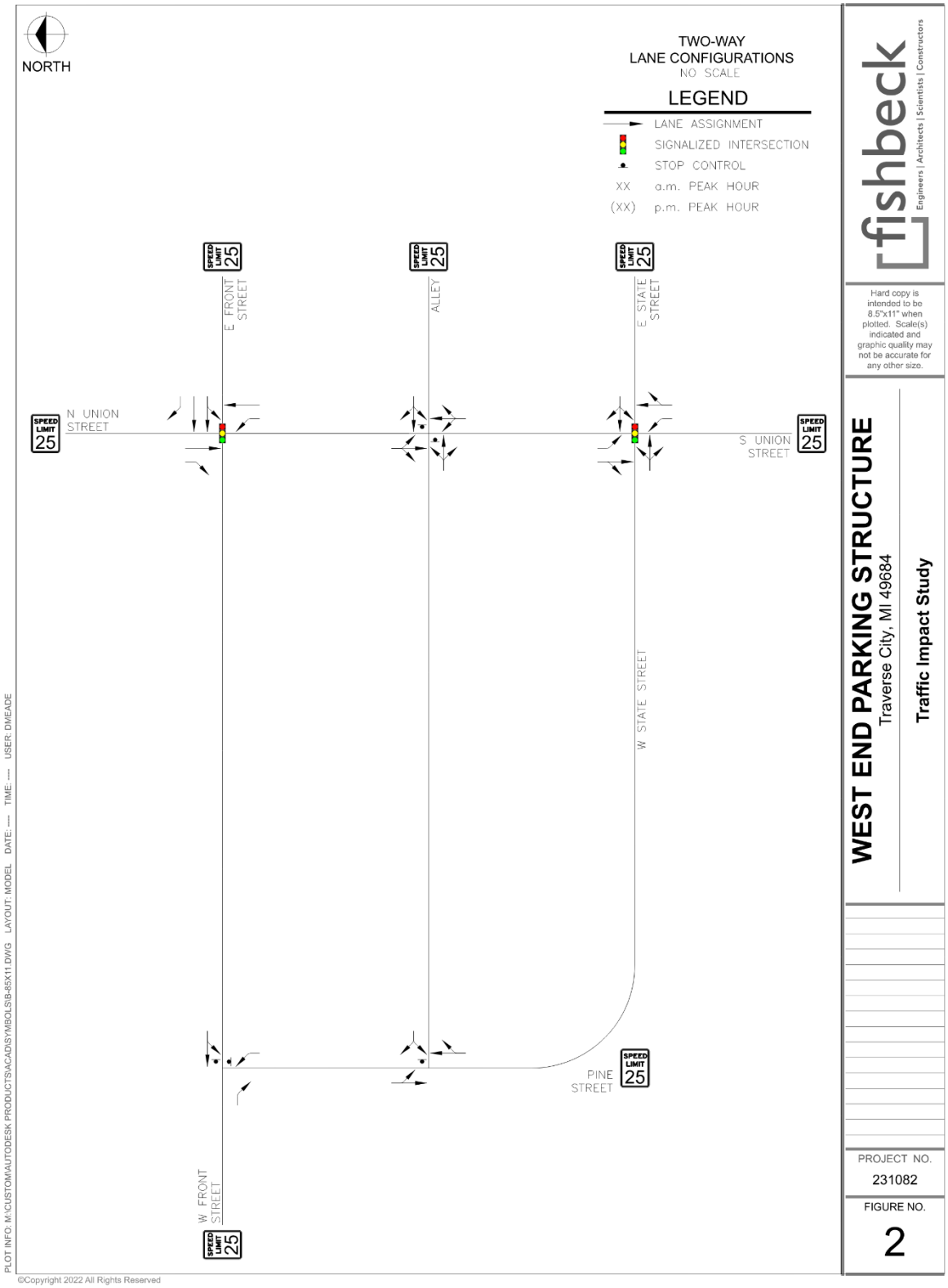


Figure 3 – One-Way Lane Configurations

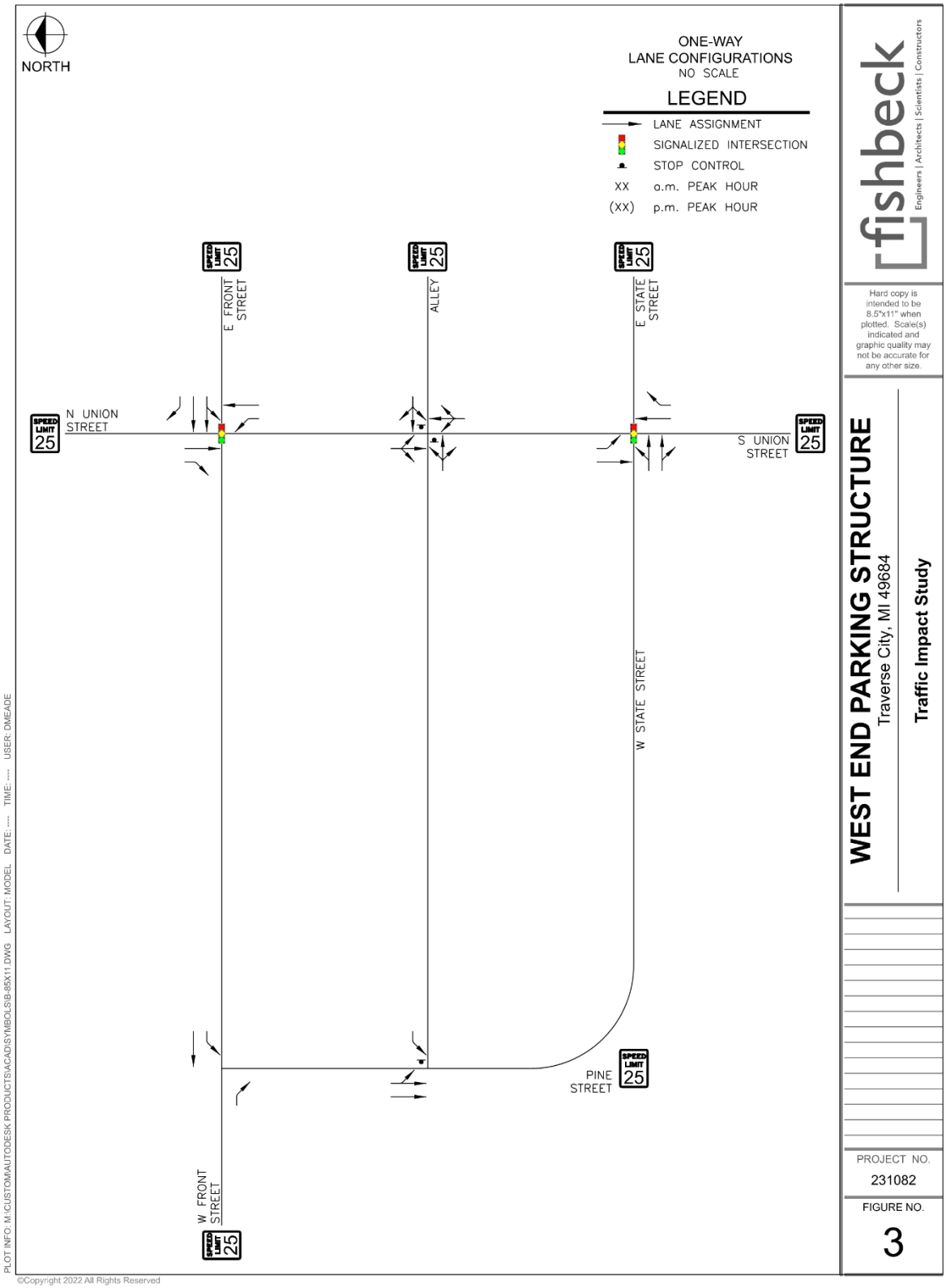


Figure 4 – Two-Way Baseline Traffic Volumes

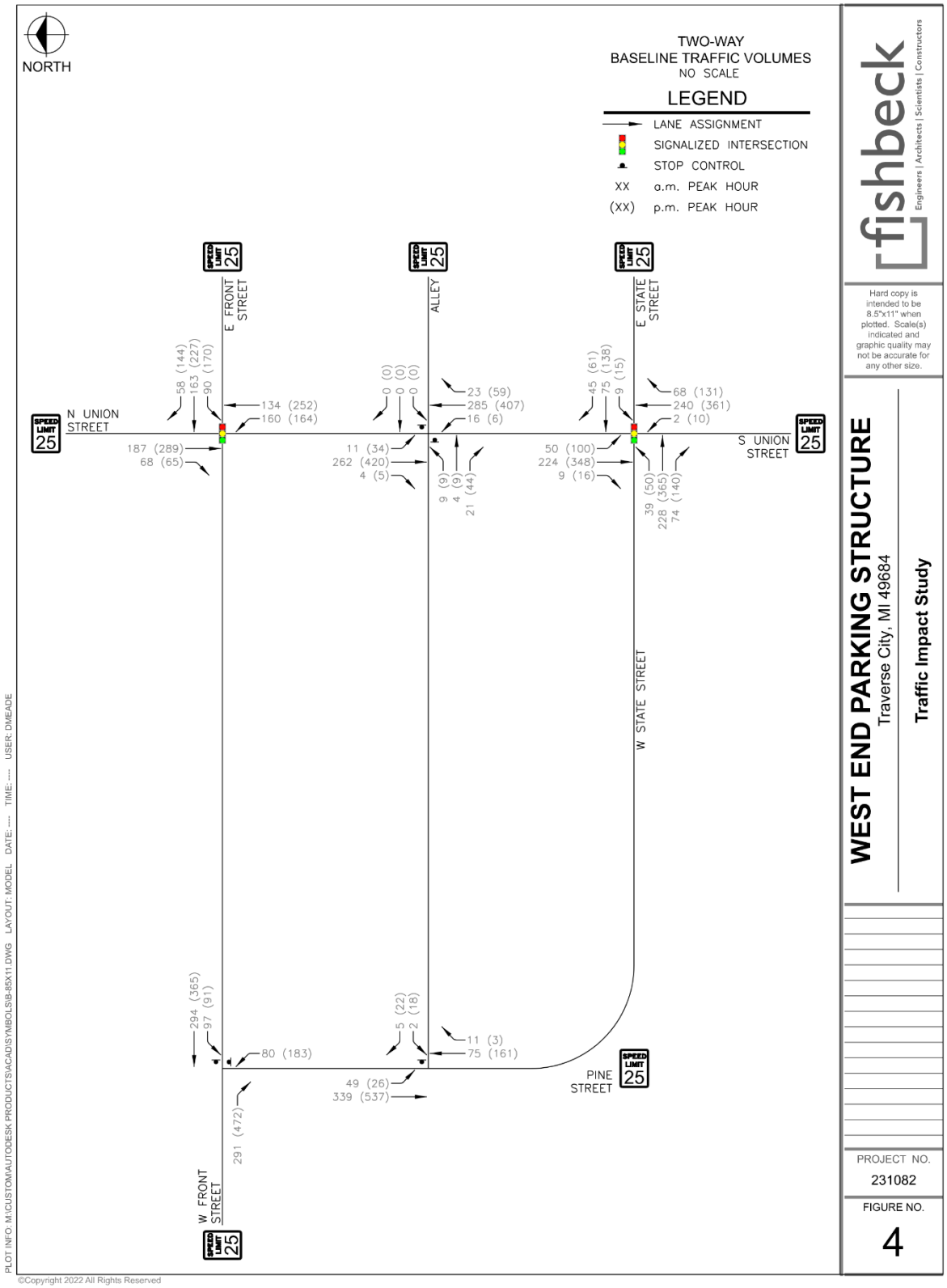
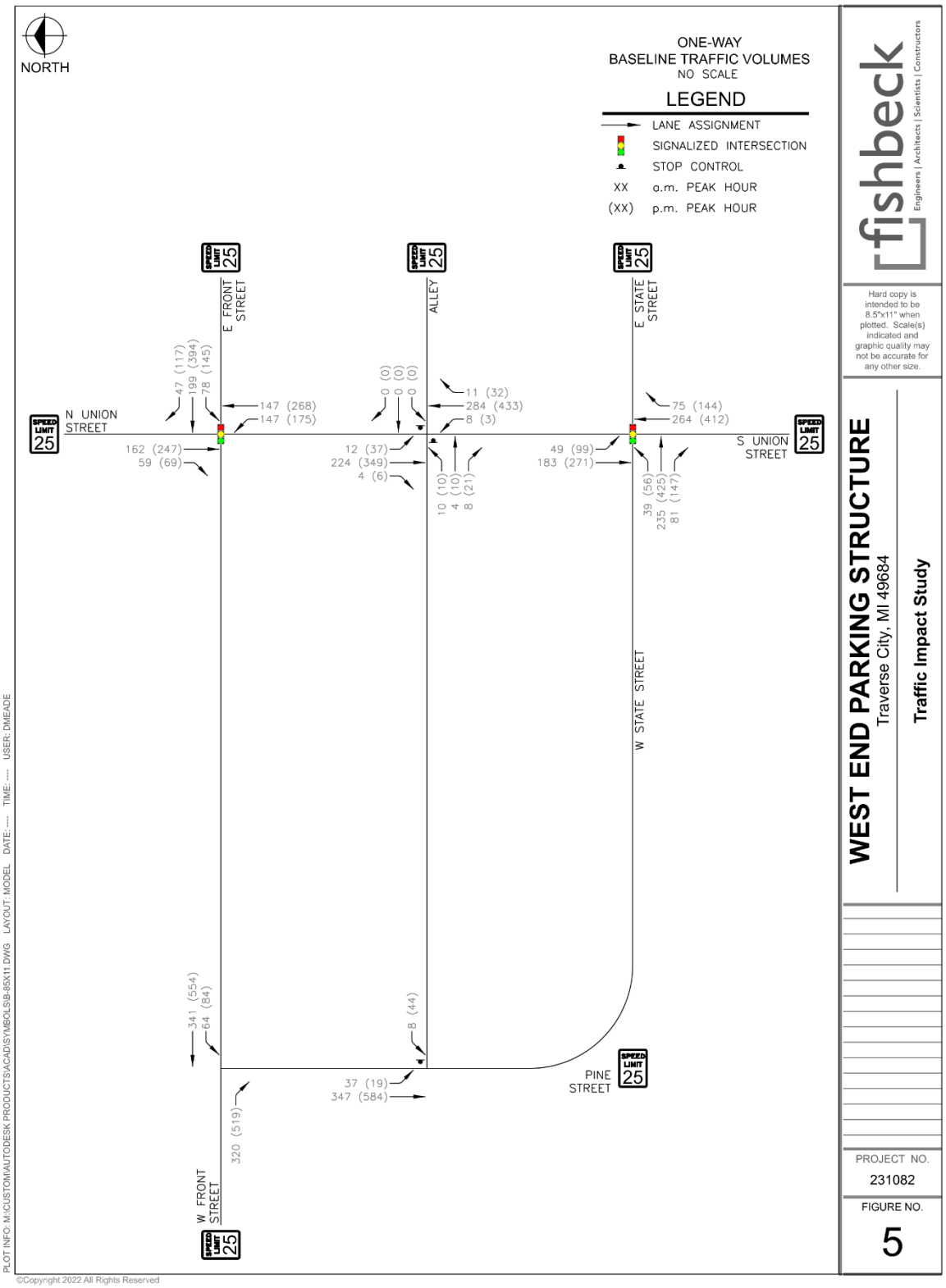


Figure 5 – One-Way Baseline Traffic Volumes



3.0 Existing and Background Conditions Analysis

3.1 Traffic Operations Analysis Methodology

Synchro (Version 11.1.3.34) was used to perform HCM operational analyses during the a.m. and p.m. peak hours for all intersections within this study. All modeling was conducted according to the MDOT *Electronic Traffic Control Device Guidelines, 2021* (ETCDG). According to the most recent editions of the HCM, Level of Service (LOS) is a qualitative measure describing operational conditions of a traffic stream or intersection. LOS ranges from A to F, with LOS A representing desirable traffic operations characterized by low delay and LOS F representing extremely poor traffic operations characterized by excessive delays and long vehicle queues. LOS D is generally considered acceptable for most areas. Table 2 – LOS Criteria presents the HCM criteria for various LOSs for unsignalized and signalized intersections. The color coding in the table is used in the capacity analysis summary tables later in this report.

Table 2 – LOS Criteria

LOS	Average Stopped Vehicle Delay (seconds)	
	Unsignalized	Signalized
A	≤ 10	≤ 10
B	> 10 and ≤ 15	> 10 and ≤ 20
C	> 15 and ≤ 25	> 20 and ≤ 35
D	> 25 and ≤ 35	> 35 and ≤ 55
E	> 35 and ≤ 50	> 55 and ≤ 80
F	> 50	> 80

3.2 Background (No-Build) Conditions

For the purposes of this study, “baseline” conditions refer to traffic volumes, lane configurations, and traffic control that exist or will exist in the immediate future, regardless of the proposed project. Given the conservative approach taken to develop the baseline traffic volumes, the adjustments made to the collected traffic counts are assumed to account for any peak seasonal variations, background development, potential COVID-19 impacts, and ambient background growth to 2026, when the parking structure will open. The Background 2026 conditions will be referenced as a basis for comparison to determine:

- Improvements that may be required on the study road network, regardless of the proposed project; and
- Impacts of the proposed project on the study road network, including improvements that may be required to facilitate new traffic patterns for the proposed parking structure.

Existing 2023 conditions were not analyzed separately from the Background 2026 conditions. Due to the conservative approach taken to develop the baseline traffic volumes, no tangible operational differences are expected between Existing 2023 and Background 2026 scenarios.

Synchro models for the existing network were created based on the existing roadway configurations and traffic controls. Where applicable, data concerning the existing intersection and roadway lane configurations, geometry, and traffic control that were observed in the field, available aerial imagery, and available street level imagery were entered in the models. The traffic signal timing permits for the signalized intersections were provided by the City for use in the models. Analysis was completed for both the current two-way operations and the previous one-way operations, which will assist the City and DDA in evaluating the impacts of the roadway modifications, and if further improvements will be required under either traffic flow configuration.

The intersection of Pine Street and Front Street cannot be evaluated using HCM 6th Edition or HCM 2000 Edition methodology under two-way traffic conditions due to the atypical stop-control configuration where NB and WB

are required to stop and EB is allowed to move freely. For this intersection, delays were calculated using SimTraffic simulations for the two-way operations. Under one-way operations, no delays were calculated or reported as all vehicular movements are allowed operate freely.

3.3 Two-Way Operations

The resulting LOS and delay for the background conditions under two-way traffic operations are provided in Table 3 – LOS Analysis for Background Conditions Two-Way Operations.

Table 3 – LOS Analysis for Background Conditions Two-Way Operations

Approach	LOS/Delay(s)			
	Two-Way Operations			
	a.m. Peak Hour		p.m. Peak Hour	
Union Street and Front Street (Signalized)				
WB Front Street	B	11.8	B	13.1
NB Union Street	C	25.9	C	26.8
SB Union Street	B	11.8	B	13.2
Overall	B	17.2	B	17.3
Union Street and State Street (Signalized)				
EB State Street	B	18.2	C	33.8
WB State Street	B	12.0	B	12.9
NB Union Street	B	16.7	C	21.2
SB Union Street	C	23.7	C	29.9
Overall	B	18.5	C	26.7
Pine Street and Front Street (NB and WB Stop-Controlled)				
EB Front Street	A	1.4	A	2.6
WB Front Street	A	8.4	C	16.0
NB Pine Street	A	6.8	B	11.3
Overall	A	5.5	A	9.4
Pine Street and Alley (WB Stop-Controlled)				
WB Alley	B	10.4	B	13.9
NB Pine Street	A	0.0	A	0.0
SB Pine Street	A	0.9	A	0.4
Overall	A	1.0	A	1.1
Union Street and Alley (EB and WB Stop-Controlled)				
EB Alley	B	14.2	C	24.8
WB Alley	A	0.0	A	0.0
NB Union Street	A	0.4	A	0.1
SB Union Street	A	0.3	A	0.7
Overall	A	1.2	A	2.6

Further analysis of the LOS results for background conditions under two-way traffic conditions revealed all movements, approaches, and intersections operate at an acceptable LOS D or better during the a.m. and p.m. peak hours for two-way operations.

SimTraffic simulations were also reviewed to observe network operations and vehicle queues. Simulations were calibrated based on MDOT ETCDG and input from the City regarding typical peak period queues. For background

conditions under two-way traffic operations, study network operations are generally acceptable; however, there were three areas where notable queues were observed in the simulations.

Along NB and SB Union Street, the left turn queues occasionally spill out of their respective storage lengths. These queues typically dissipate within one cycle length and no major queue blockages were identified. The traffic signals on Union Street at Front Street and State Street currently operate on two phases and do not provide left turn protection (green arrow).

Regular queuing occurs on the EB approach of State Street at Union Street. During the a.m. peak hour, the 95th percentile queue length was 201' (8 vehicles) and the average queue length was 120' (5 vehicles). During the p.m. peak hour for two-way traffic operations, the 95th percentile queue length was 492' (20 vehicles) and the average queue length was 275' (11 vehicles). The EB approach currently operates with a single shared left/thru/right lane under two-way traffic operations. Vehicles turning from EB State Street to NB Union Street must wait for both a gap in oncoming traffic and a gap in pedestrian traffic. EB vehicles that wish to continue straight or turn right onto SB Union Street cannot do so until the left turning vehicle has completed their movement.

The third location was the WB approach at the intersection of Front Street and Pine Street. At this location, both the WB and NB approaches are required to stop under two-way operations, while the EB approach operates freely. A queue develops on the WB approach associated with traffic, which is required to come to a full stop, wait for a single NB vehicle to turn, then continue on their desired path. Occasionally, a WB vehicle would be destinated onto SB Pine Street and would need to wait for a gap in EB to SB turning traffic.

See Appendix 2 – Two-Way Operations Background LOS Output Reports for the two-way traffic operation background conditions LOS reports and queueing analysis reports.

3.4 One-Way Operations

The resulting LOS and delay for the one-way traffic operations background (no-build) conditions are provided in Table 4 – LOS Analysis for Background Conditions One-Way Operations.

Table 4 – LOS Analysis for Background Conditions One-Way Operations

Approach	LOS/Delay(s)			
	One-Way Operations			
	a.m. Peak Hour		p.m. Peak Hour	
Union Street and Front Street (Signalized)				
WB Front Street	B	11.9	B	13.8
NB Union Street	C	24.5	C	26.4
SB Union Street	B	11.5	B	12.5
Overall	B	16.7	B	17.3
Union Street and State Street (Signalized)				
EB State Street	B	13.1	B	15.6
NB Union Street	B	13.6	B	14.9
SB Union Street	C	22.0	C	26.0
Overall	B	15.4	B	18.1
Pine Street and Alley (WB Stop-Controlled)				
WB Alley	B	11.1	B	12.0
SB Pine Street	A	0.8	A	0.3
Overall	A	1.1	A	1.2

Table 4 – LOS Analysis for Background Conditions One-Way Operations

Approach	LOS/Delay(s)			
	One-Way Operations			
	a.m. Peak Hour		p.m. Peak Hour	
Union Street and Alley (EB and WB Stop-Controlled)				
EB Alley	B	14.7	C	24.7
WB Alley	A	0.0	A	0.0
NB Union Street	A	0.2	A	0.1
SB Union Street	A	0.4	A	0.9
Overall	A	0.9	A	2.1

Further analysis of the LOS results for one-way traffic operations background conditions revealed all movements, approaches, and intersections operate at an acceptable LOS D or better during the a.m. and p.m. peak hours for one-way traffic operations.

SimTraffic simulations were also reviewed to observe network operations and vehicle queues. Simulations were calibrated based on MDOT ETCDG and input from the City regarding typical peak period queues. For background one-way traffic operations, study network operations are generally acceptable; however, there was one location where notable queues were observed in the simulations. Along NB and SB Union Street, the left turn queues occasionally spill out of their respective storage lengths. These queues typically dissipate within one cycle length and no major queue blockages were identified.

See Appendix 3 – One-Way Operations Background LOS Output Reports for the one-way traffic operations background conditions LOS reports and queueing analysis reports.

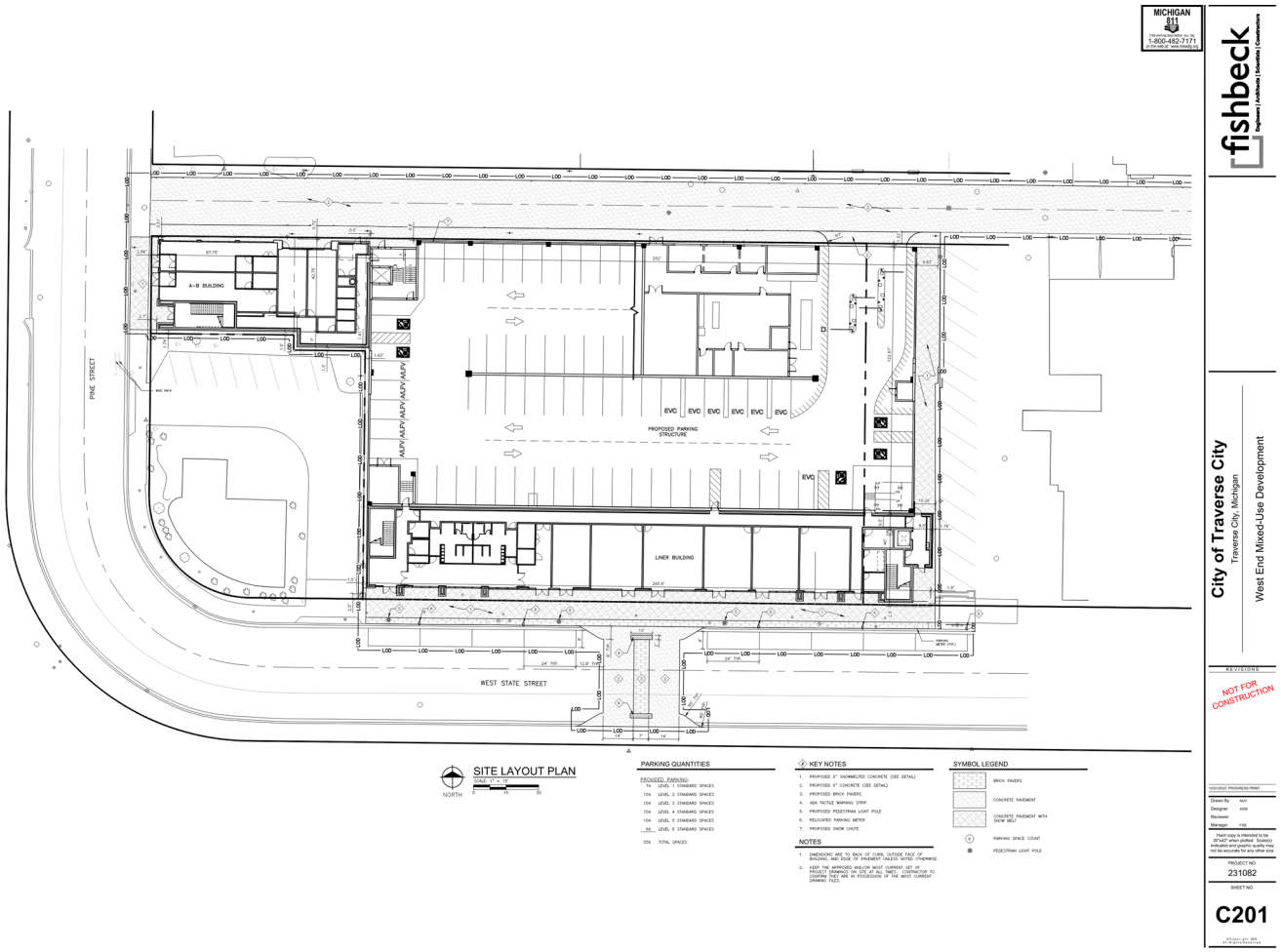
4.0 Site Traffic Characteristics

This section presents information regarding the additional traffic volumes and expected traffic pattern changes associated with the proposed project. A narrative description of the project, the traffic generated by the project, the directional distribution of the project traffic, and an assignment of peak hour traffic volumes to the adjacent roadways are presented in this section.

4.1 Parking Structure

The West End Parking Structure will be constructed along the north side of State Street between Pine and Union Streets. Access to the structure will be provided from the alley that connects Pine Street and Union Street on the north side of the proposed structure. On the south side of the parking structure along W State Street, there will be first floor retail/commercial space and residential on the remaining floors. The proposed parking structure will be built in one phase and provide approximately 530 parking spaces. A representation of the current conceptual site pan are shown in Figure 6 – Conceptual Site Plan.

Figure 6 – Conceptual Site Plan (not to scale)



4.2 Proposed Site Traffic

For a typical TIS, site trip generation would be forecast based on the proposed land use, density, and data published in *Trip Generation* by ITE. In the case of new parking supply, vehicular traffic demand is relative to the land uses served by the parking supply, mix of expected users, expected turnover rates of each parking area, as well as the ability to process entry/exit of any gated/paid parking facility.

Fishbeck parking engineers/planners provided calculations for the number of hourly vehicular trips expected in and out of each parking area based on knowledge of the area land uses, mix of expected users, and extensive experience with turnover/service rates and overall parking structure operations. The new parking supply is expected to mainly serve the western portions of downtown Traverse City, including commercial and residential users of the structure liner building. Future weekday peak hour traffic volumes associated with new parking supply were calculated for the morning and afternoon peak periods.

The location of these parking sites within Downtown lends to the possibility of parked vehicles visiting multiple area land uses on a single trip. These trips are referred to as "internal capture" trips and can reduce the traffic generation potential of a facility. Conservatively, no internal capture calculations were applied, and all trips in and out of each parking lot were assumed to be independent vehicular trips. Additionally, commercial establishments often generate "pass-by" trips, which are already present on the study network and are interrupted to visit a particular land use. For this study, the number of vehicle trips associated with the increased parking supply were conservatively all assumed to be "new" trips to the study network. This conservative approach combined with upward adjustment of baseline volumes is expected to account for traffic generated by other area developments.

Table 5 – Trip Generation present the resulting trip generation forecasts for the parking structure. The project is anticipated to be open in 2026 and will be referred to as the Opening Year Build.

Table 5 – Trip Generation

Location	Unit	Amount	a.m. Peak Hour			p.m. Peak Hour		
			In	Out	Total	In	Out	Total
West End Parking Structure	Parking Spaces	530	260	131	391	191	313	504
Total New Trips			260	131	391	191	313	504

4.3 Trip Distribution

The directions that site traffic will travel to and from were based upon existing traffic patterns during the afternoon and evening peak hours and an assessment of the surrounding roadway network. The existing traffic patterns reflect the gravity between origins and destinations in the study area, and therefore an accurate indication of where the proposed trips would be coming from and going to. Key rationale for this distribution model includes the following items, and the resultant distribution percentages are shown in Table 6 – Trip Distribution.

Table 6 – Trip Distribution

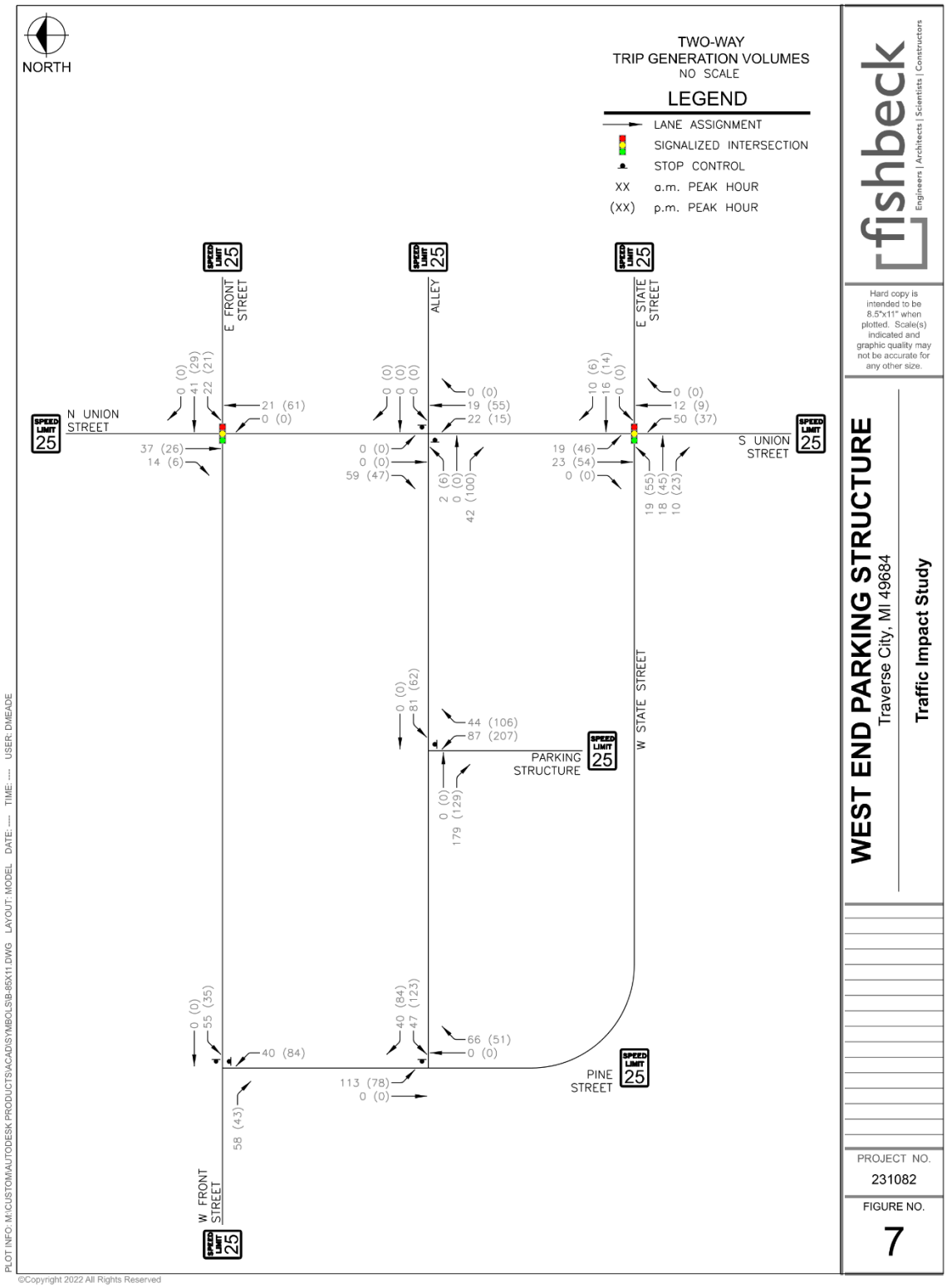
Direction	Via	Two-Way Traffic Operations				One-Way Traffic Operations			
		a.m. Peak Hour		p.m. Peak Hour		a.m. Peak Hour		p.m. Peak Hour	
		To	From	To	From	To	From	To	From
North	Union Street	16%	20%	19%	17%	17%	18%	19%	16%
South	Union Street	25%	24%	25%	24%	23%	28%	21%	27%
East	Front Street	-	24%	-	26%	-	27%	-	32%
	State Street	28%	10%	29%	10%	31%	-	33%	-
West	Front Street	31%	22%	27%	23%	29%	27%	27%	25%

4.4 Trip Assignment

The assignment of traffic to the study roadway network is based on the trip generation forecast in conjunction with the expected directional distribution described above. Trips were assigned to the adjacent roadways based on this model and the proposed site access location. The proposed parking structure will have one access point to the Alley which will operate under stop-control on the parking structure driveway.

The site trips indicated in Figure 7 – Two-Way Trip Generation Volumes and Figure 8 – One-Way Trip Generation Volumes. These trips were added to the background/baseline volumes (Figure 4 – Two-Way Baseline Traffic Volumes and Figure 5 – One-Way Baseline Traffic Volumes) to result in the future conditions volumes in Figure 9 – Two-Way Future Traffic Volumes and Figure 10 – One-Way Future Traffic Volumes.

Figure 7 – Two-Way Trip Generation Volumes



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Figure 8 – One-Way Trip Generation Volumes

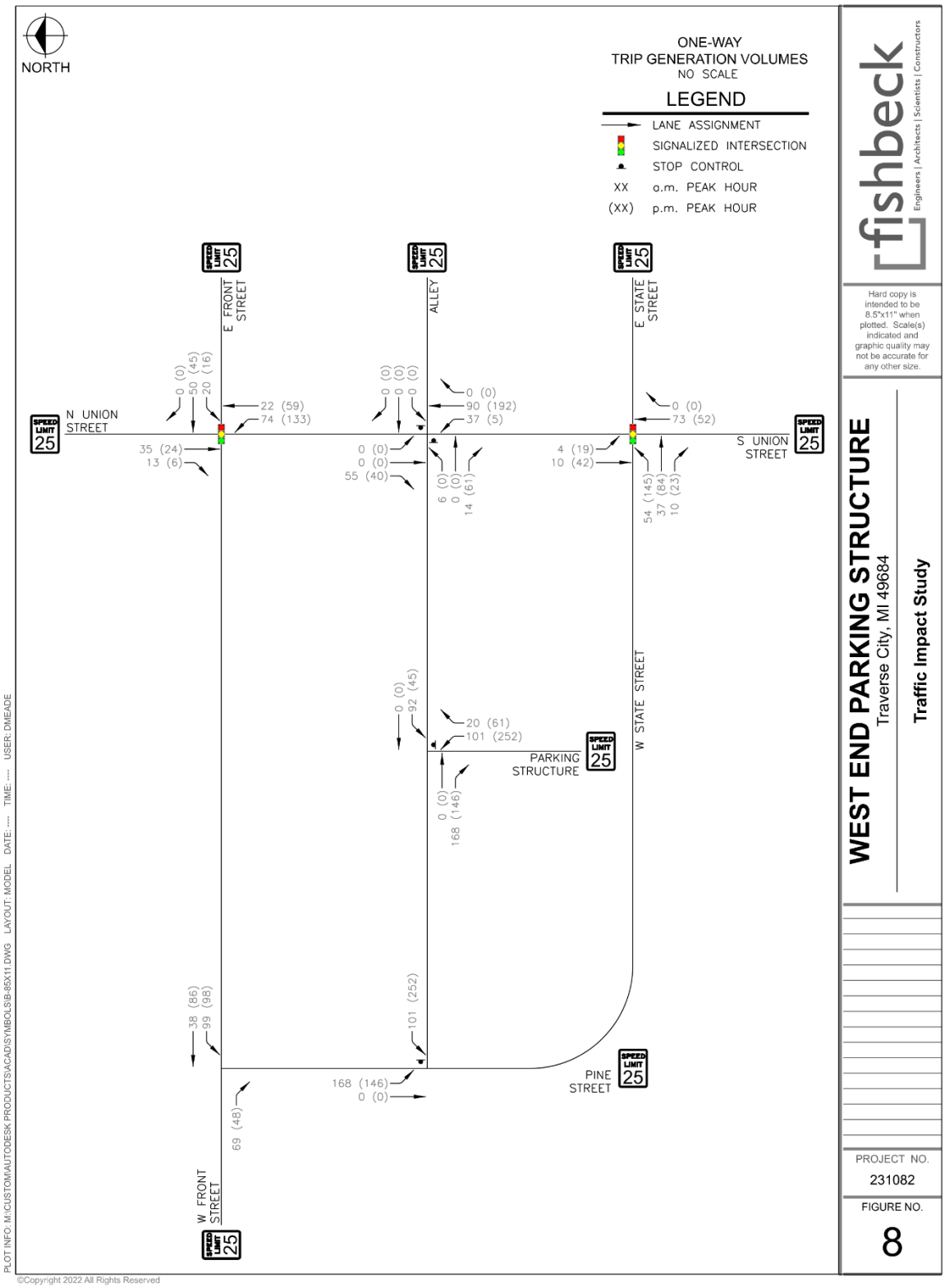


Figure 9 – Two-Way Future Traffic Volumes

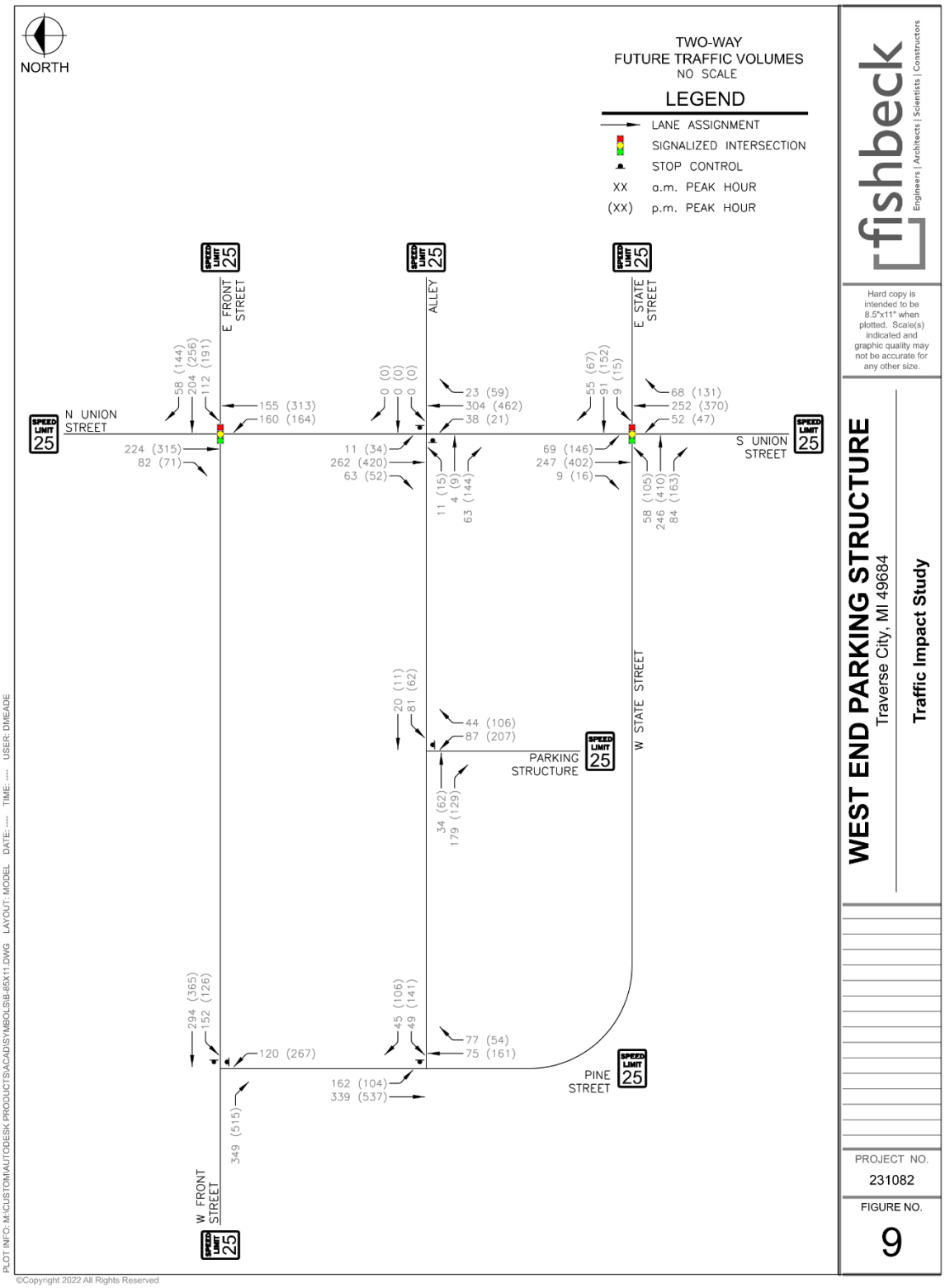
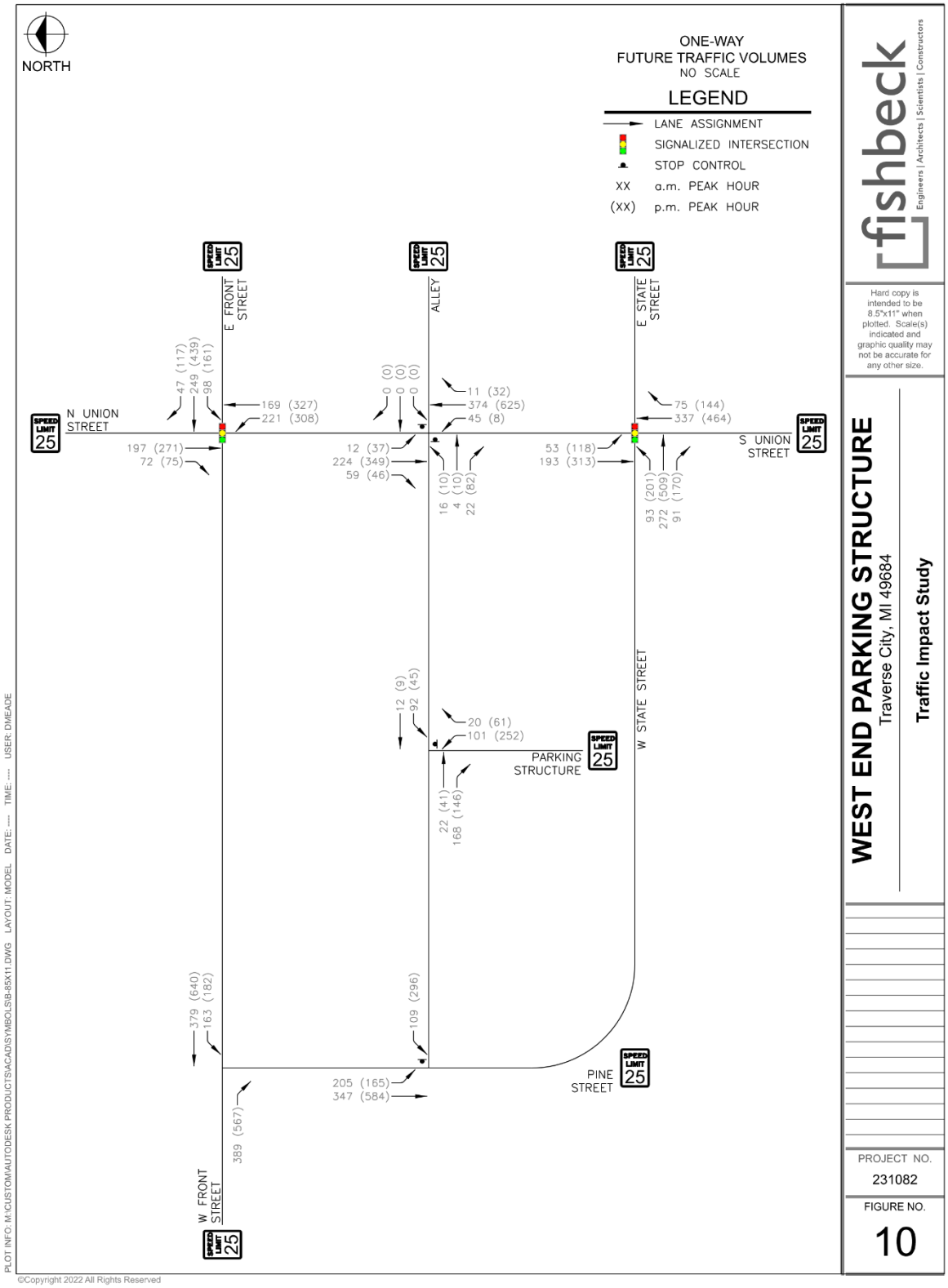


Figure 10 – One-Way Future Traffic Volumes



5.0 Build Conditions Analysis

The objective of this TIS is to determine what impacts, if any, the proposed parking structure will have on traffic operations along adjacent public roadways and what mitigation measures may be warranted as a result of this project. To quantify these impacts, the intersection traffic operations under the Background (no-build) conditions were compared to operations under the Build conditions scenarios. For any project related impacts, potential mitigation measures were identified and evaluated.

5.1 Two-Way Traffic Operations

5.1.1 Future Conditions

The resulting LOS and delay for the two-way traffic operations build conditions are provided in Table 7 – LOS Analysis for Future Conditions Two-Way Operations.

Table 7 – LOS Analysis for Future Conditions Two-Way Operations

Approach	LOS/Delay(s)			
	Two-Way Operations			
	a.m. Peak Hour		p.m. Peak Hour	
Union Street and Front Street (Signalized)				
WB Front Street	B	12.3	B	13.4
NB Union Street	C	26.9	C	27.8
SB Union Street	B	12.2	B	13.6
Overall	B	17.4	B	18.0
Union Street and State Street (Signalized)				
EB State Street	C	21.2	F	88.4
WB State Street	B	12.4	B	13.2
NB Union Street	B	17.3	C	22.0
SB Union Street	C	25.0	C	34.3
Overall	B	19.9	D	46.3
Pine Street and Front Street (NB and WB Stop-Controlled)				
EB Front Street	A	1.7	F	164.5
WB Front Street	B	12.2	F	80.3
NB Pine Street	A	8.1	D	29.4
Overall	A	7.7	F	105.0
Pine Street and Alley (WB Stop-Controlled)				
WB Alley	C	20.8	F	117.9
NB Pine Street	A	0.0	A	0.0
SB Pine Street	A	2.6	A	1.3
Overall	A	5.5	D	29.3
Union Street and Alley (EB and WB Stop-Controlled)				
EB Alley	C	15.1	F	58.6
WB Alley	A	0.0	A	0.0
NB Union Street	A	0.9	A	0.4
SB Union Street	A	0.3	A	0.6
Overall	A	2.2	B	11.5

Table 7 – LOS Analysis for Future Conditions Two-Way Operations

Approach	LOS/Delay(s)			
	Two-Way Operations			
	a.m. Peak Hour		p.m. Peak Hour	
Alley and Parking Structure (NB Stop-Controlled)				
EB Alley	A	0.0	A	0.0
WB Alley	A	6.3	A	6.6
NB Parking Structure	B	11.5	B	14.0
Overall	A	4.8	A	8.4

Further analysis of the LOS results for future conditions under two-way traffic operations revealed that all movements, approaches, and intersections operate at an acceptable LOS C or better during the a.m. peak hour. During the p.m. peak hour, several movements and approaches would degrade significantly, with the following movements, approaches, and intersections operating at an LOS E or F during the p.m. peak hour:

- Union Street and State Street:
  - The EB approach would operate at LOS F.
- Pine Street and Front Street:
  - The WB left and WB thru movements, the EB and WB approaches, and the overall intersection would operate at LOS F.
- Pine Street and Alley:
  - The WB approach would operate at LOS F.
- Union Street and Alley:
  - The EB approach would operate at LOS F.

SimTraffic simulations were also reviewed to observe network operations and vehicle queues. For future conditions under two-way traffic operations, study network operations are acceptable during the a.m. peak hour. During the p.m. peak hour, significant queueing was observed, with the entire study network becoming gridlocked during each simulation run absent of any network improvements.

At the intersection of Union Stret and State Street the EB approach becomes critical during the p.m. peak hour, as queues spill back into adjacent intersections causing network gridlock. The same is observed on the WB approach at the intersection of Front Street and Pine Street. Simulated queues become critical during the p.m. peak hour, as queues spill back into adjacent intersections causing network gridlock. See Appendix 4 – Two-Way Operations Future LOS Output Reports for the two-way traffic operations future conditions LOS reports and queueing analysis reports.

5.1.2 Future Improvement Conditions

In order to allow the network to operate acceptably under future conditions with two-way traffic operations, the following improvements are recommended:

- Union Street and State Street:
  - Construct an EB left turn lane with a minimum of 100’ of storage.
- Pine Street and Front Street:
  - Reconfigure the WB approach to allow for separation of WB left turning traffic and WB thru traffic.
  - Advanced signage along WB Front Street will be required to inform drivers of the left-hand lane drop at Pine Street.
  - In association with ongoing evaluation of two-way operations on Pine Street, conduct a specific review of the atypical stop-control configuration and consider alternative traffic control such as minor stop control, all-way stop control, or signalization as warranted.

The resulting LOS and delay for the two-way traffic operations build conditions with the recommended improvements are provided in Table 8 – LOS Analysis for Future Improvement Conditions Two-Way Operations.

Table 8 – LOS Analysis for Future Conditions Two-Way Operations

Approach	LOS/Delay(s)			
	Two-Way Operations			
	a.m. Peak Hour		p.m. Peak Hour	
Union Street and Front Street (Signalized)				
WB Front Street	B	12.3	B	13.4
NB Union Street	C	26.9	C	27.8
SB Union Street	B	12.2	B	13.6
Overall	B	17.4	B	18.0
Union Street and State Street (Signalized)				
EB State Street	B	16.2	C	28.2
WB State Street	B	12.4	B	14.8
NB Union Street	B	17.3	C	22.0
SB Union Street	C	25.0	C	34.3
Overall	B	18.4	C	27.0
Pine Street and Front Street (NB and WB Stop-Controlled)				
EB Front Street	A	1.9	B	13.8
WB Front Street	B	10.0	E	36.8
NB Pine Street	A	7.6	D	22.4
Overall	A	6.7	C	24.4
Pine Street and Alley (WB Stop-Controlled)				
WB Alley	C	20.8	F	117.9
NB Pine Street	A	0.0	A	0.0
SB Pine Street	A	2.6	A	1.3
Overall	A	5.5	D	29.3
Union Street and Alley (EB and WB Stop-Controlled)				
EB Alley	C	15.1	F	58.6
WB Alley	A	0.0	A	0.0
NB Union Street	A	0.9	A	0.4
SB Union Street	A	0.3	A	0.6
Overall	A	2.2	B	11.5
Alley and Parking Structure (NB Stop-Controlled)				
EB Alley	A	0.0	A	0.0
WB Alley	A	6.3	A	6.6
NB Parking Structure	B	11.5	B	14.0
Overall	A	4.8	A	8.4

Further analysis of the LOS results for future improvement conditions under two-way traffic operations revealed that all movements, approaches, and intersections operate at an acceptable LOS C or better during the a.m. peak hour. During the p.m. peak hour, the recommended improvements result in significant operational improvements for the study network.

SimTraffic simulations were also reviewed to observe network operations and vehicle queues. For two-way traffic operations future conditions, study network operations are acceptable during the a.m. peak hour. During the p.m. peak hour, study network operations are considered acceptable for a Downtown area during peak summer conditions. Along NB and SB Union Street, the left turn queues occasionally spill out of their respective storage lengths. These queues typically dissipate within one cycle length. Network queues do not cause gridlock.

Queues along the Alley to turn onto Union Street or Pine Street occasionally extend to the parking structure. These queues typically dissipate within a few minutes as traffic continues to clear in other parts of the network. Simulations indicate that the most critical queue on the alley forms EB at Union Street. Although the volume of left turn and thru traffic are low on this approach, these movements are difficult to complete and block right-turn traffic; thereby increasing queue lengths. Given the low volume of traffic on these movements, the City may consider prohibiting left turns from the alley to Union Street and/or making this a right-turn only approach.

See Appendix 5 – Two-Way Operations Future Improvement LOS Output Reports for the two-way traffic operations future improvement conditions LOS reports and queueing analysis reports.

5.2 One-Way Operations

5.2.1 Future Conditions

The resulting LOS and delay for the one-way traffic operations build conditions are provided in Table 9 – LOS Analysis for Future Conditions One-Way Operations.

Table 9 – LOS Analysis for Future Conditions One-Way Operations

Approach	LOS/Delay(s)			
	One-Way Operations			
	a.m. Peak Hour		p.m. Peak Hour	
Union Street and Front Street (Signalized)				
WB Front Street	B	12.4	B	14.3
NB Union Street	C	29.9	A	8.0
SB Union Street	B	11.9	B	12.9
Overall	B	19.5	B	11.7
Union Street and State Street (Signalized)				
EB State Street	B	14.3	B	19.7
NB Union Street	B	14.7	B	15.7
SB Union Street	C	23.0	A	3.1
Overall	B	16.3	B	14.3
Pine Street and Alley (WB Stop-Controlled)				
WB Alley	E	35.2	F	194.1
SB Pine Street	A	3.0	A	2.1
Overall	B	10.6	F	61.8
Union Street and Alley (EB and WB Stop-Controlled)				
EB Alley	C	17.9	D	31.9
WB Alley	A	0.0	A	0.0
NB Union Street	A	0.9	A	0.1
SB Union Street	A	0.3	A	0.8
Overall	A	1.7	A	4.2
Alley and Parking Structure (NB Stop-Controlled)				
EB Alley	A	0.0	A	0.0
WB Alley	A	6.9	A	6.4
NB Parking Structure	B	11.9	B	13.5
Overall	A	5.2	A	8.3

Further analysis of the LOS results for one-way traffic operations future conditions revealed that most movements, approaches, and intersections operate at an acceptable LOS D or better during the a.m. and p.m. peak hours; however, the WB approach on the alley at Pine Street would operate at an LOS E or F.

SimTraffic simulations were also reviewed to observe network operations and vehicle queues. For one-way traffic operations future conditions, study network operations are considered acceptable for a Downtown area during peak summer conditions. Along NB and SB Union Street, the left turn queues occasionally spill out of their respective storage lengths and typically dissipate within one cycle length. At the intersection of Union Street and Front Steet, the NB left turn queues do not always dissipate and can cause significant backups along Union Street, which spill onto adjacent streets within the study network.

No additional queueing issues were identified. See Appendix 6 – One-Way Operations Future LOS Output Reports for the one-way traffic operations future conditions LOS reports and queueing analysis reports.

5.2.2 Future Improvement Conditions

In order to allow the network to operate acceptably under future conditions with one-way traffic operations, the City should consider protected left turn phasing on Union Street, in particular NB at Front Street. In order to clear left turn queues such that thru traffic can progress on NB Union Street, left turn protection should lead the thru green (protected/permissive). Allocation of green time to provide left-turn protection will increase delays for conflicting movements; however, models developed for this study indicate acceptable operations can be achieved. That stated, introducing additional phasing may interrupt signal coordination which is beyond the scope of this study network and such implications should be evaluated on a broader scale.

The resulting LOS and delay for the one-way traffic operations future conditions with the recommended improvements are provided in Table 10 – LOS Analysis for Future Improvement Conditions One-Way Operations.

Table 10 – LOS Analysis for Future Improvement Conditions One-Way Operations

Approach	LOS/Delay(s)			
	One-Way Operations			
	a.m. Peak Hour		p.m. Peak Hour	
Union Street and Front Street (Signalized)				
WB Front Street	B	16.4	B	19.2
NB Union Street	A	5.9	B	12.3
SB Union Street	B	15.8	B	17.2
Overall	B	11.9	B	16.3
Union Street and State Street (Signalized)				
EB State Street	B	14.3	B	19.7
NB Union Street	B	14.7	B	15.7
SB Union Street	A	1.2	A	3.1
Overall	B	11.7	B	14.3
Pine Street and Alley (WB Stop-Controlled)				
WB Alley	E	35.2	F	194.1
SB Pine Street	A	3.0	A	2.1
Overall	B	10.6	F	61.8
Union Street and Alley (EB and WB Stop-Controlled)				
EB Alley	C	17.9	D	31.9
WB Alley	A	0.0	A	0.0
NB Union Street	A	0.9	A	0.1
SB Union Street	A	0.3	A	0.8
Overall	A	1.7	A	4.2
Alley and Parking Structure (NB Stop-Controlled)				
EB Alley	A	0.0	A	0.0
WB Alley	A	6.9	A	6.4
NB Parking Structure	B	11.9	B	13.5
Overall	A	5.2	A	8.3

SimTraffic simulations were also reviewed to observe network operations and vehicle queues with the suggested left-turn phasing. For one-way traffic operations future improvement conditions, study network operations are acceptable. Along NB and SB Union Street, the left turn queues occasionally spill out of their respective storage lengths; however, these queues typically dissipate within one cycle length. No additional queueing issues were identified. See Appendix 7 – One-Way Operations Future Improvement LOS Output Reports for the one-way traffic operations future improvement conditions LOS reports and queueing analysis reports.

5.3 Two-Way and One-Way Comparison

A comparison of LOS by approach between the two-way traffic operations future improvement conditions and one-way traffic operations future improvement conditions is provided in Table 11 – Two-Way vs. One-Way Comparison.

Table 11 – Two-Way vs. One-Way Comparison

Intersection	LOS/Delay(s)							
	Two-Way Operations				One-Way Operations			
	a.m. Peak Hour		p.m. Peak Hour		a.m. Peak Hour		p.m. Peak Hour	
Union Street and Front Street (Signalized)	B	17.4	B	18.0	B	11.9	B	16.3
Union Street and State Street (Signalized)	B	18.4	C	27.0	B	11.7	B	14.3
Front Street and Pine Street (NB and WB Stop-Controlled)	A	6.7	C	24.4	-		-	
Pine Street and Alley (WB Stop-Controlled)	A	5.5	D	29.3	B	10.6	F	61.8
Union Street and Alley (EB and WB Stop-Controlled)	A	2.2	B	11.5	A	1.7	A	4.2
Alley and Parking Structure (NB Stop-Controlled)	A	4.8	A	8.4	A	5.2	A	8.3

Based on review of future improvement conditions for two-way and one-way traffic operations, both configurations can process the demand of the new parking structure with the recommended improvements. The completion of the parking structure would not be a deciding factor on whether to continue the two-way operations within downtown Traverse City or to revert to one-way operations. Although one-way conditions may indicate lesser overall intersection delays, limited access provided by one-way flows can concentrate volumes on critical movements and increase vehicle miles travelled. The decision to retain two-way operations or revert to one-way operations must consider additional pros and cons that are beyond the purview of this study.

6.0 Findings and Recommendations

The analyses conducted for this TIS indicate that the proposed parking structure will not create new impacts to the adjacent road network. The consolidation of parking demand to a single location will, however, exacerbate existing capacity deficiencies both under one-way and two-way conditions. The extent of feasible improvements necessary to facilitate the concentration of parking from surface lots to a new parking structure were identified based on the results of the operational analyses as well as the following considerations:

- Existing turn lane storage lengths are constrained by buildings, on-street parking, and sidewalk. These relatively short storage lengths are periodically exceeded with or without this project. Generally, extensive reconstruction and/or the loss of parking spaces are not warranted to extend these storage lengths.
- Existing nor planned transit or non-motorized facilities in the site vicinity would not be significantly impacted by the project. More extensive vehicular capacity improvements would tend to degrade the pedestrian environment by lengthening pedestrian crossing distances and increasing vehicle speeds.

In summary, the following are recommended to facilitate the new parking structure and improve operations for all network users. Conceptual drawings are included on the following pages.

Regardless of the proposed project:

The City should continue to monitor the following issues identified by this study:

- Union Street (all conditions):
  - Evaluate leading protected/permitted left turn phasing to clear left turn queues and allow thru traffic to progress. Introducing left turn phasing may interrupt signal coordination which is beyond the scope of this study network and such implications should be evaluated on a broader scale.
- Union Street and State Street (two-way conditions):
  - The EB approach currently operates with a shared left/thru/right lane. Left turning vehicles can cause significant backups while waiting for a gap in oncoming traffic to complete their movement. If these queueing issues become excessive, an EB left turn lane should be constructed.
- Front Street and Pine Street (two-way conditions):
  - The WB approach currently operates with a shared left/thru lane. The intersection currently has stop-control on the NB and WB approaches. WB left turning vehicles can cause significant backups while waiting for a gap in EB traffic to complete their movement. If these queueing issues become excessive, the WB approach should be reconfigured to separate left and thru traffic. Alternative traffic control such as minor stop control, all-way stop control, or signalization (as warranted) should also be considered.

With the proposed project under Two-Way Traffic Conditions:

- Union Street and State Street:
  - Construct an EB left turn lane with a minimum of 100’ of storage. See Figure 11 – Union Street and State Street Proposed Lane Configuration (Two-Way Traffic Operations).
- Front Street and Pine Street:
  - Reconfigure the WB approach to allow for separation of WB left turning traffic and WB thru traffic.
  - This will require advanced signing along Front Street to inform drivers of the left-hand lane drop at Pine Street. See Figure 12 – Front Street and Pine Street Proposed Lane Configuration (Two-Way Traffic Operations).
- Union Street and Alley:
  - Consider a left turn prohibition from the alley onto NB Union Street.

With the proposed project under One-Way Traffic Conditions:

- Union Street and Front Street:
  - Protected left turn phasing on Union Street becomes critical for the NB left turn to Front Street with the proposed parking structure. Consider leading protected/permitted left turn phasing to clear left turn queue and allow thru traffic to clear the intersection.
- Union Street and Alley:
  - Consider a left turn prohibition from the alley onto NB Union Street.

Figure 11 – Union Steet and State Street Proposed Lane Configuration (Two-Way Traffic Operations)

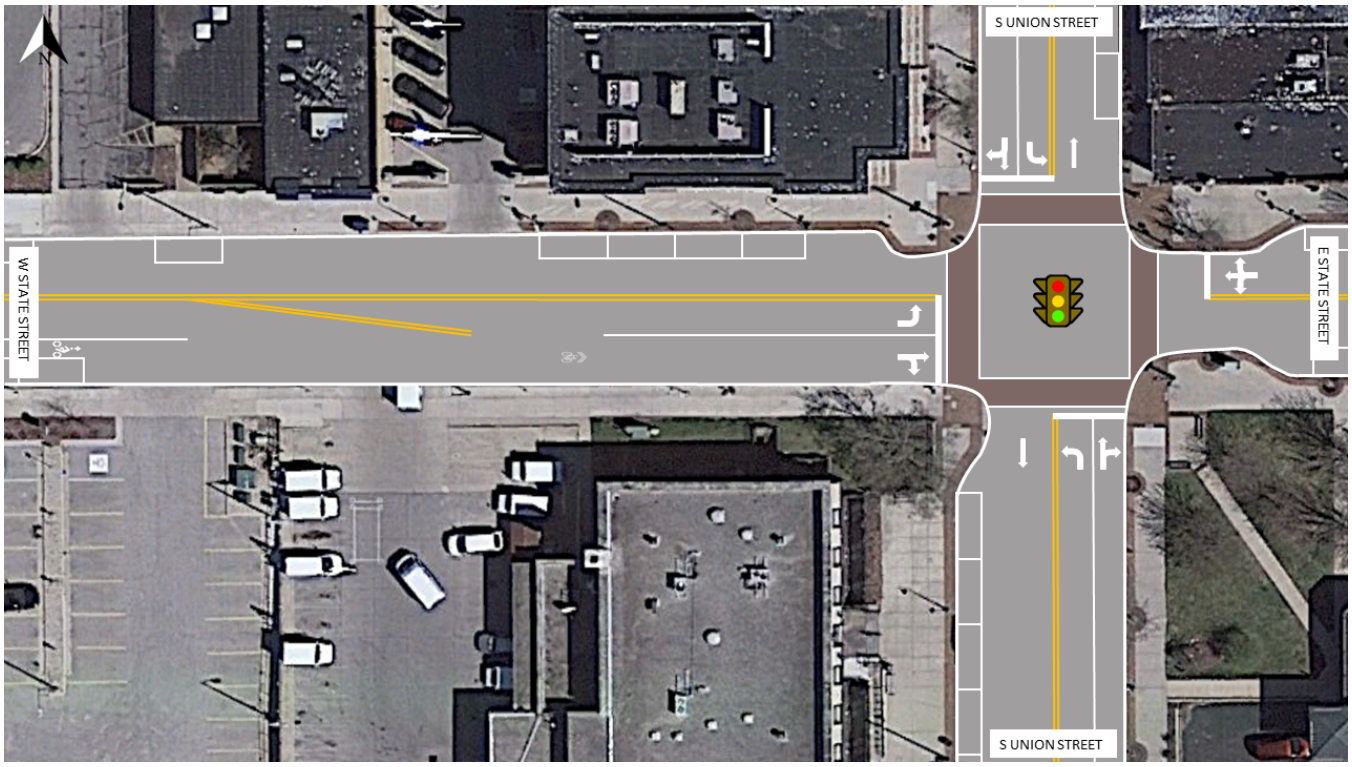
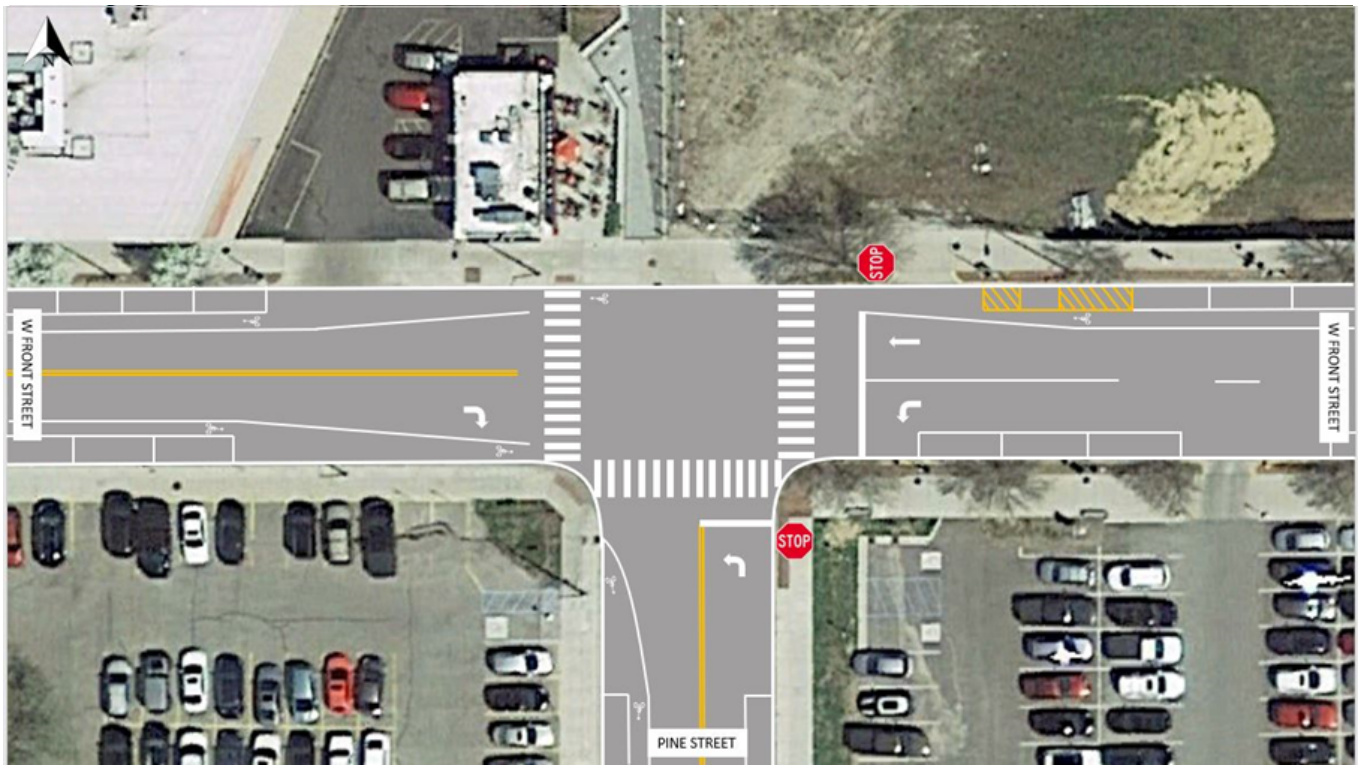


Figure 12 – Front Street and Pine Street Proposed Lane Configuration (Two-Way Traffic Operations)



Appendix 1

Two-Way Traffic Operations a.m. Peak Hour

Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Pedestrians			
#1 - Front Street & Union Street	a.m. Peak Hour		PHF					0.88			0.72			0.82					
	Varies		% Heavy					7%			5%			5%		EB	WB	NB	SB
	Varies	2023	Existing				71	163	58	134	112			147	68	28	22	46	27
		2023	Existing Adj.				90	163	58	160	134			187	68				
		2021	PAE Count				70	180	45	110	115			150	55				
		2023	Background				90	163	58	160	134			187	68				
			Bckgrd. Dev. A																
			Bckgrd. Dev. B																
			Bckgrd. Dev. C																
			Total Background				90	163	58	160	134			187	68				
			Site Generated				22	41			21			37	14				
			Pass By																
			Total Site Gen				22	41	0	0	21			37	14				
			Total Future				112	204	58	160	155			224	82				

Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Pedestrians			
#2 - State Street & Union Street	a.m. Peak Hour		PHF		0.84			0.94			0.77			0.85					
	Varies		% Heavy		3%			5%			3%			3%		EB	WB	NB	SB
	Varies	2023	Existing	39	223	72	9	75	45	2	240	68	113	161	9	13	15	24	14
		2023	Existing Adj.	39	228	74	9	75	45	2	240	68	50	224	9				
		2021	PAE Count	35	210	75	0	0	0	0	200	50	45	160	0				
		2023	Background	39	228	74	9	75	45	2	240	68	50	224	9				
			Bckgrd. Dev. A																
			Bckgrd. Dev. B																
			Bckgrd. Dev. C																
			Total Background	39	228	74	9	75	45	2	240	68	50	224	9				
			Site Generated	19	18	10		16	10	50	12		19	23					
			Pass By																
			Total Site Gen	19	18	10	0	16	10	50	12	0	19	23	0				
			Total Future	58	246	84	9	91	55	52	252	68	69	247	9				

Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Pedestrians			
#3 - Front Street & Pine Street	a.m. Peak Hour		PHF		0.78			0.87			0.73								
	Varies		% Heavy		1%			7%			5%					EB	WB	NB	SB
	Varies	2023	Existing			291	58	175		67						62	6	20	
		2023	Existing Adj.			291	97	294		80									
		2021	PAE Count			290	60	250		0									
		2023	Background			291	97	294		80									
			Bckgrd. Dev. A																
			Bckgrd. Dev. B																
			Bckgrd. Dev. C																
			Total Background			291	97	294		80									
			Site Generated			58	55			40									
			Pass By																
			Total Site Gen			58	55	0		40									
			Total Future			349	152	294		120									

Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Pedestrians			
#4 - Pine Street & Alley	a.m. Peak Hour		PHF					0.60			0.94			0.94					
	08/24/23		% Heavy					29%			4%			3%		EB	WB	NB	SB
	8:00 - 9:00 a.m.	2023	Existing				2		5		39	6	34	235			6	4	1
		2023	Existing Adj.				2		5		75	11	49	339					
		2021	PAE Count								0	0		335					
		2023	Background				2		5		75	11	49	339					
			Bckgrd. Dev. A																
			Bckgrd. Dev. B																
			Bckgrd. Dev. C																
			Total Background				2		5		75	11	49	339					
			Site Generated				47		40			66	113						
			Pass By																
			Total Site Gen				47		40		0	66	113	0					
			Total Future				49		45		75	77	162	339					

Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Pedestrians			
#5 - Union Street & Alley	a.m. Peak Hour		PHF		0.71			0.00			0.86			0.70					
	08/24/23		% Heavy		0%			0%			2%			3%		EB	WB	NB	SB
	8:00 - 9:00 a.m.	2023	Existing	9	4	7	0	0	0	7	124	10	11	88	4	15	10	5	5
		2023	Existing Adj.	9	4	21	0	0	0	16	285	23	11	262	4				
		2021	PAE Count								230			215					
		2023	Background	9	4	21	0	0	0	16	285	23	11	262	4				
			Bckgrd. Dev. A																
			Bckgrd. Dev. B																
			Bckgrd. Dev. C																
			Total Background	9	4	21	0	0	0	16	285	23	11	262	4				
			Site Generated	2		42				22	19				59				
			Pass By																
			Total Site Gen	2	0	42	0	0	0	22	19	0	0	0	59				
			Total Future	11	4	63	0	0	0	38	304	23	11	262	63				

Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Pedestrians			
#6 - Alley and Parking Structure	a.m. Peak Hour		PHF																
	Varies		% Heavy													EB	WB	NB	SB
	Varies	2023	Existing		34			20								0	0	0	0
		2023	Existing Adj.	0	34	0	0	20	0	0	0	0	0	0	0				
		2023	Background	0	34	0	0	20	0	0	0	0	0	0	0				
			Bckgrd. Dev. A																
			Bckgrd. Dev. B																
			Bckgrd. Dev. C																
			Total Background	0	34	0	0	20	0	0	0	0	0	0	0				
			Site Generated			179	81			87		44							
			Pass By																
			Total Site Gen	0	0	179	81	0	0	87	0	44	0	0	0				
			Total Future	0	34	179	81	20	0	87	0	44	0	0	0				

Count Date:
Count Year: 2023
Existing Adj. Year: 2023
Existing Adjustment Rate: 1.00

Growth Rate: 0.0%
Buildout Year: 2023
Scenario: a.m. Peak Hour

Bckgrd. Dev. A:
Bckgrd. Dev. B:
Bckgrd. Dev. C:

Updated to

Two-Way Traffic Operations p.m. Peak Hour

Count Date:	
Count Year:	2023
Existing Adj. Year:	2023
Existing Adjustment Rate:	1.00
Growth Rate:	0.0%
Buildout Year:	2023
Scenario:	p.m. Peak Hour
Bckgrd. Dev. A:	
Bckgrd. Dev. B:	
Bckgrd. Dev. C:	
	Updated to

Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Pedestrians			
	p.m. Peak Hour		PHF					0.87			0.89			0.80					
#1 - Front Street & Union Street	Varies		% Heavy					3%			2%			4%		EB	WB	NB	SB
	Varies	2023	Existing				**120**	**227**	**144**	**159**	**244**			**204**	**65**	**52**	**145**	**113**	**72**
		2023	Existing Adj.				170	227	144	164	252			289	65				
		2021	PAE Count				120	310	105	160	245			165	65				
		2023	Background				170	227	144	164	252			289	65				
			Bckgrd. Dev. A																
			Bckgrd. Dev. B																
			Bckgrd. Dev. C																
			Total Background				**170**	**227**	**144**	**164**	**252**			**289**	**65**				
			Site Generated				21	29			61			26	6				
			Pass By																
			Total Site Gen				21	29	0	0	61			26	6				
			Total Future				**191**	**256**	**144**	**164**	**313**			**315**	**71**				

Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Pedestrians			
	p.m. Peak Hour		PHF		0.93			0.95			0.94			0.82					
#2 - State Street & Union Street	Varies		% Heavy		3%			1%			2%			1%		EB	WB	NB	SB
	Varies	2023	Existing	**50**	**332**	**127**	**15**	**138**	**61**	**10**	**361**	**131**	**202**	**246**	**16**	**28**	**30**	**22**	**38**
		2023	Existing Adj.	50	365	140	15	138	61	10	361	131	100	348	16				
		2021	PAE Count	50	370	130	0	0	0	0	360	130	90	200					
		2023	Background	50	365	140	15	138	61	10	361	131	100	348	16				
			Bckgrd. Dev. A																
			Bckgrd. Dev. B																
			Bckgrd. Dev. C																
			Total Background	**50**	**365**	**140**	**15**	**138**	**61**	**10**	**361**	**131**	**100**	**348**	**16**				
			Site Generated	55	45	23		14	6	37	9		46	54					
			Pass By																
			Total Site Gen	55	45	23	0	14	6	37	9	0	46	54	0				
			Total Future	**105**	**410**	**163**	**15**	**152**	**67**	**47**	**370**	**131**	**146**	**402**	**16**				

Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Pedestrians			
	p.m. Peak Hour		PHF		0.95			0.83			0.93								
#3 - Front Street & Pine Street	Varies		% Heavy		0%			4%			3%					EB	WB	NB	SB
	Varies	2023	Existing			**472**	**76**	**303**		**172**						**36**	**21**	**59**	
		2023	Existing Adj.			472	91	365		183									
		2021	PAE Count			475	75	505		0									
		2023	Background			472	91	365		183									
			Bckgrd. Dev. A																
			Bckgrd. Dev. B																
			Bckgrd. Dev. C																
			Total Background			**472**	**91**	**365**		**183**									
			Site Generated			43	35			84									
			Pass By																
			Total Site Gen			43	35	0		84									
			Total Future			**515**	**126**	**365**		**267**									

Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Pedestrians			
	p.m. Peak Hour		PHF					0.77			0.79			0.88					
#4 - Pine Street & Alley	08/24/23		% Heavy					0%			1%			3%		EB	WB	NB	SB
	4:30 -5:30 p.m.	2023	Existing				**18**		**22**		**96**	**2**	**17**	**361**			**9**	**3**	**24**
Data from 8/27/23 Mio cams		2023	Existing Adj.				18		22		161	3	26	537					
		2021	PAE Count								0			550					
		2023	Background				18		22		161	3	26	537					
			Bckgrd. Dev. A																
			Bckgrd. Dev. B																
			Bckgrd. Dev. C																
			Total Background				**18**		**22**		**161**	**3**	**26**	**537**					
			Site Generated				123		84			51	78						
			Pass By																
			Total Site Gen				123		84		0	51	78	0					
			Total Future				**141**		**106**		**161**	**54**	**104**	**537**					

Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Pedestrians			
	p.m. Peak Hour		PHF		0.62			0.00			0.93			0.88					
#5 - Union Street & Alley	08/24/23		% Heavy		0%			0%			3%			1%		EB	WB	NB	SB
	4:30 -5:30 p.m.	2023	Existing	**9**	**9**	**19**	**0**	**0**	**0**	**3**	**202**	**29**	**34**	**183**	**5**	**98**	**74**	**21**	**5**
Data from 8/27/23 Mio cams		2023	Existing Adj.	9	9	44	0	0	0	6	407	59	34	420	5				
		2021	PAE Count								410			290					
		2023	Background	9	9	44	0	0	0	6	407	59	34	420	5				
			Bckgrd. Dev. A																
			Bckgrd. Dev. B																
			Bckgrd. Dev. C																
			Total Background	**9**	**9**	**44**	**0**	**0**	**0**	**6**	**407**	**59**	**34**	**420**	**5**				
			Site Generated	6		100				15	55				47				
			Pass By																
			Total Site Gen	6	0	100	0	0	0	15	55	0	0	0	47				
			Total Future	**15**	**9**	**144**	**0**	**0**	**0**	**21**	**462**	**59**	**34**	**420**	**52**				

Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Pedestrians			
	p.m. Peak Hour		PHF																
#6 - Alley and Parking Structure	Varies		% Heavy													EB	WB	NB	SB
	Varies	2023	Existing		**62**			**11**								**0**	**0**	**0**	**0**
		2023	Existing Adj.	0	62	0	0	11	0	0	0	0	0	0	0				
		2023	Background	0	62	0	0	11	0	0	0	0	0	0	0				
			Bckgrd. Dev. A																
			Bckgrd. Dev. B																
			Bckgrd. Dev. C																
			Total Background	**0**	**62**	**0**	**0**	**11**	**0**	**0**	**0**	**0**	**0**	**0**	**0**				
			Site Generated			129	62			207		106							
			Pass By																
			Total Site Gen	0	0	129	62	0	0	207	0	106	0	0	0				
			Total Future	**0**	**62**	**129**	**62**	**11**	**0**	**207**	**0**	**106**	**0**	**0**	**0**				

One-Way Traffic Operations a.m. Peak Hour

Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Pedestrians			
	a.m. Peak Hour		PHF					0.88			0.72			0.82					
#1 - Front Street & Union Street	07/20/21		% Heavy					5%			5%			5%		EB	WB	NB	SB
	8:00 - 9:00 a.m.	2023	Existing				**71**	**181**	**43**	**134**	**112**			**147**	**54**	**28**	**22**	**46**	**27**
		2023	Existing Adj.				78	199	47	147	147			162	59				
		2023	Background				78	199	47	147	147			162	59				
			Bckgrd. Dev. A																
			Bckgrd. Dev. B																
			Bckgrd. Dev. C																
			Total Background				**78**	**199**	**47**	**147**	**147**			**162**	**59**				
			Site Generated				20	50		74	22			35	13				
			Pass By																
			Total Site Gen				20	50	0	74	22			35	13				
			Total Future				**98**	**249**	**47**	**221**	**169**			**197**	**72**				

Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Pedestrians			
	a.m. Peak Hour		PHF		0.79						0.77			0.85					
#2 - State Street & Union Street	07/20/21		% Heavy		4%						3%			3%		EB	WB	NB	SB
	8:00 - 9:00 a.m.	2023	Existing	**35**	**208**	**72**					**240**	**68**	**44**	**161**		**13**	**15**	**24**	**14**
		2023	Existing Adj.	39	235	81					264	75	49	183					
		2023	Background	39	235	81					264	75	49	183					
			Bckgrd. Dev. A																
			Bckgrd. Dev. B																
			Bckgrd. Dev. C																
			Total Background	**39**	**235**	**81**					**264**	**75**	**49**	**183**					
			Site Generated	54	37	10					73		4	10					
			Pass By																
			Total Site Gen	54	37	10					73	0	4	10					
			Total Future	**93**	**272**	**91**					**337**	**75**	**53**	**193**					

Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Pedestrians			
	a.m. Peak Hour		PHF		0.78			0.84											
#3 - Front Street & Pine Street	07/15/21		% Heavy		1%			11%								EB	WB	NB	SB
	8:00 - 9:00 a.m.	2023	Existing			**291**	**58**	**226**								**62**	**6**	**20**	
		2023	Existing Adj.			320	64	341											
		2023	Background			320	64	341											
			Bckgrd. Dev. A																
			Bckgrd. Dev. B																
			Bckgrd. Dev. C																
			Total Background			**320**	**64**	**341**											
			Site Generated			69	99	38											
			Pass By																
			Total Site Gen			69	99	38											
			Total Future			**389**	**163**	**379**											

Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Pedestrians			
	a.m. Peak Hour		PHF					0.60			0.94			0.94					
#4 - Pine Street & Alley	08/24/23		% Heavy					29%			4%			3%		EB	WB	NB	SB
	8:00 - 9:00 a.m.	2023	Existing				**7**						**34**	**235**			**6**	**4**	**1**
Data from 8/27/23 Mio cams		2023	Existing Adj.				8						37	347					
		2023	Background				8						37	347					
			Bckgrd. Dev. A																
			Bckgrd. Dev. B																
			Bckgrd. Dev. C																
			Total Background				**8**						**37**	**347**					
			Site Generated				101						168						
			Pass By																
			Total Site Gen				101						168	0					
			Total Future				**109**						**205**	**347**					

Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Pedestrians			
	a.m. Peak Hour		PHF		0.71			0.00			0.86			0.70					
#5 - Union Street & Alley	08/24/23		% Heavy		0%			0%			2%			3%		EB	WB	NB	SB
	8:00 - 9:00 a.m.	2023	Existing	**9**	**4**	**7**	**0**	**0**	**0**	**7**	**124**	**10**	**11**	**88**	**4**	**15**	**10**	**5**	**5**
Data from 8/27/23 Mio cams		2023	Existing Adj.	10	4	8	0	0	0	8	294	11	12	224	4				
		2023	Background	10	4	8	0	0	0	8	284	11	12	224	4				
			Bckgrd. Dev. A																
			Bckgrd. Dev. B																
			Bckgrd. Dev. C																
			Total Background	**10**	**4**	**8**	**0**	**0**	**0**	**8**	**284**	**11**	**12**	**224**	**4**				
			Site Generated	6		14				37	90				55				
			Pass By																
			Total Site Gen	6	0	14	0	0	0	37	90	0	0	0	55				
			Total Future	**16**	**4**	**22**	**0**	**0**	**0**	**45**	**374**	**11**	**12**	**224**	**59**				

Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Pedestrians			
	a.m. Peak Hour		PHF																
#6 - Alley and Parking Structure	Varies		% Heavy													EB	WB	NB	SB
	Varies	2023	Existing		**22**			**12**								**0**	**0**	**0**	**0**
		2023	Existing Adj.	0	22	0	0	12	0	0	0	0	0	0	0				
		2023	Background	0	22	0	0	12	0	0	0	0	0	0	0				
			Bckgrd. Dev. A																
			Bckgrd. Dev. B																
			Bckgrd. Dev. C																
			Total Background	**0**	**22**	**0**	**0**	**12**	**0**	**0**	**0**	**0**	**0**	**0**	**0**				
			Site Generated			168	92			101		20							
			Pass By																
			Total Site Gen	0	0	168	92	0	0	101	0	20	0	0	0				
			Total Future	**0**	**22**	**168**	**92**	**12**	**0**	**101**	**0**	**20**	**0**	**0**	**0**				

Count Date:	Varies
Count Year:	2023
Existing Adj. Year:	2023
Existing Adjustment Rate:	1.10
Growth Rate:	0.0%
Buildout Year:	2023
Scenario:	a.m. Peak Hour

Bckgrd. Dev. A:
Bckgrd. Dev. B:
Bckgrd. Dev. C:

Updated to balance

One-Way Traffic Operations p.m. Peak Hour

Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Pedestrians			
	p.m. Peak Hour		PHF					0.85			0.89			0.80					
#1 - Front Street & Union Street	07/20/21		% Heavy					2%			2%			4%		EB	WB	NB	SB
	4:30 - 5:30 p.m.	2023	Existing				**120**	**310**	**106**	**159**	**244**			**204**	**63**	**52**	**145**	**113**	**72**
		2023	Existing Adj.				145	394	117	175	268			247	69				
		2023	Background				145	394	117	175	268			247	69				
			Bckgrd. Dev. A																
			Bckgrd. Dev. B																
			Bckgrd. Dev. C																
			Total Background				**145**	**394**	**117**	**175**	**268**			**247**	**69**				
			Site Generated				16	45		133	59			24	6				
			Pass By																
			Total Site Gen				16	45	0	133	59			24	6				
			Total Future				**161**	**439**	**117**	**308**	**327**			**271**	**75**				

Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Pedestrians			
	p.m. Peak Hour		PHF		0.91						0.94			0.93					
#2 - State Street & Union Street	07/20/21		% Heavy		1%						2%			2%		EB	WB	NB	SB
	4:15 -5:15 p.m.	2023	Existing	**49**	**367**	**127**					**361**	**131**	**90**	**246**		**28**	**30**	**22**	**38**
		2023	Existing Adj.	56	425	147					412	144	99	271					
		2023	Background	56	425	147					412	144	99	271					
			Bckgrd. Dev. A																
			Bckgrd. Dev. B																
			Bckgrd. Dev. C																
			Total Background	**56**	**425**	**147**					**412**	**144**	**99**	**271**					
			Site Generated	145	84	23					52		19	42					
			Pass By																
			Total Site Gen	145	84	23					52	0	19	42					
			Total Future	**201**	**509**	**170**					**464**	**144**	**118**	**313**					

Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Pedestrians			
	p.m. Peak Hour		PHF		0.95			0.83											
#3 - Front Street & Pine Street	07/15/21		% Heavy		0%			4%								EB	WB	NB	SB
	4:00 -5:00 p.m.	2023	Existing			**472**	**76**	**504**								**36**	**21**	**59**	
		2023	Existing Adj.			519	84	554											
		2023	Background			519	84	554											
			Bckgrd. Dev. A																
			Bckgrd. Dev. B																
			Bckgrd. Dev. C																
			Total Background			**519**	**84**	**554**											
			Site Generated			48	98	86											
			Pass By																
			Total Site Gen			48	98	86											
			Total Future			**567**	**182**	**640**											

Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Pedestrians			
	p.m. Peak Hour		PHF					0.77						0.88					
#4 - Pine Street & Alley	08/24/23		% Heavy					0%						3%		EB	WB	NB	SB
	4:30 -5:30 p.m.	2023	Existing				**40**						**17**	**361**			**9**	**3**	**24**
		2023	Existing Adj.				44						19	584					
		2023	Background				44						19	584					
			Bckgrd. Dev. A																
			Bckgrd. Dev. B																
			Bckgrd. Dev. C																
			Total Background				**44**						**19**	**584**					
			Site Generated				252						146						
			Pass By																
			Total Site Gen				252						146	0					
			Total Future				**296**						**165**	**584**					

Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Pedestrians			
	p.m. Peak Hour		PHF		0.62			0.00			0.93			0.88					
#5 - Union Street & Alley	08/24/23		% Heavy		0%			0%			3%			1%		EB	WB	NB	SB
	4:30 -5:30 p.m.	2023	Existing	**9**	**9**	**19**	**0**	**0**	**0**	**3**	**202**	**29**	**34**	**183**	**5**	**98**	**74**	**21**	**5**
		2023	Existing Adj.	10	10	21	0	0	0	3	433	32	37	349	6				
		2023	Background	10	10	21	0	0	0	3	433	32	37	349	6				
			Bckgrd. Dev. A																
			Bckgrd. Dev. B																
			Bckgrd. Dev. C																
			Total Background	**10**	**10**	**21**	**0**	**0**	**0**	**3**	**433**	**32**	**37**	**349**	**6**				
			Site Generated			61				5	192				40				
			Pass By																
			Total Site Gen	0	0	61	0	0	0	5	192	0	0	0	40				
			Total Future	**10**	**10**	**82**	**0**	**0**	**0**	**8**	**625**	**32**	**37**	**349**	**46**				

Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Pedestrians			
	p.m. Peak Hour		PHF																
#6 - Alley and Parking Structure	Varies		% Heavy													EB	WB	NB	SB
	Varies	2023	Existing		**41**			**9**								**0**	**0**	**0**	**0**
		2023	Existing Adj.	0	41	0	0	9	0	0	0	0	0	0	0				
		2023	Background	0	41	0	0	9	0	0	0	0	0	0	0				
			Bckgrd. Dev. A																
			Bckgrd. Dev. B																
			Bckgrd. Dev. C																
			Total Background	**0**	**41**	**0**	**0**	**9**	**0**	**0**	**0**	**0**	**0**	**0**	**0**				
			Site Generated			146	45			252		61							
			Pass By																
			Total Site Gen	0	0	146	45	0	0	252	0	61	0	0	0				
			Total Future	**0**	**41**	**146**	**45**	**9**	**0**	**252**	**0**	**61**	**0**	**0**	**0**				

Count Date:	Varies
Count Year:	2023
Existing Adj. Year:	2023
Existing Adjustment Rate:	1.10
Growth Rate:	0.0%
Buildout Year:	2023
Scenario:	p.m. Peak Hour
Bckgrd. Dev. A:	
Bckgrd. Dev. B:	
Bckgrd. Dev. C:	

Progressive AE
1811 4 Mile Rd NE

Grand Rapids, Michigan, United States 49525
(616) 361-2664

Count Name: Union St at Front St
Site Code:
Start Date: 07/20/2021

Turning Movement Data

Start Time	Front St Eastbound					Front St Westbound					Union St Northbound					Union St Southbound					
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
7:00 AM	0	0	0	2	0	3	12	3	2	18	14	13	0	3	27	0	18	9	2	27	72
7:15 AM	0	0	0	2	0	7	16	3	1	26	12	15	0	3	27	0	24	10	0	34	87
7:30 AM	0	0	0	7	0	14	27	5	7	46	24	24	0	15	48	0	31	8	3	39	133
7:45 AM	0	0	0	5	0	11	32	4	4	47	30	27	0	8	57	1	48	13	6	62	166
Hourly Total	0	0	0	16	0	35	87	15	14	137	80	79	0	29	159	1	121	40	11	162	458
8:00 AM	0	0	0	4	0	19	53	12	21	84	28	28	0	7	56	0	35	14	3	49	189
8:15 AM	0	0	0	8	0	13	34	10	5	57	31	22	0	5	53	0	28	12	5	40	150
8:30 AM	1	0	0	16	1	23	49	6	6	78	28	24	0	17	52	0	39	12	3	51	182
8:45 AM	0	0	0	13	0	16	45	15	12	76	47	38	0	7	85	0	45	16	7	61	222
Hourly Total	1	0	0	41	1	71	181	43	44	295	134	112	0	36	246	0	147	54	18	201	743
9:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:00 PM	0	0	0	53	0	23	81	37	134	141	46	55	0	88	101	0	48	14	64	62	304
4:15 PM	0	0	0	36	0	31	81	33	108	145	39	62	0	64	101	0	53	13	52	66	312
4:30 PM	0	0	0	22	0	22	76	28	80	126	35	58	0	61	93	0	63	14	60	77	296
4:45 PM	0	0	0	24	0	32	53	29	94	114	38	51	0	66	89	0	65	18	46	83	286
Hourly Total	0	0	0	135	0	108	291	127	416	526	158	226	0	279	384	0	229	59	222	288	1198
5:00 PM	0	0	0	14	0	33	83	23	71	139	43	70	0	55	113	0	37	20	51	57	309
5:15 PM	0	0	0	24	0	33	98	26	58	157	43	65	0	85	108	0	39	11	35	50	315
5:30 PM	0	0	0	24	0	26	69	19	53	114	32	65	0	48	97	0	56	19	52	75	286
5:45 PM	0	0	0	25	0	26	69	24	92	119	40	49	0	58	89	0	30	11	45	41	249
Hourly Total	0	0	0	87	0	118	319	92	274	529	158	249	0	246	407	0	162	61	183	223	1159
6:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	1	0	0	279	1	332	878	277	748	1487	530	666	0	590	1196	1	659	214	434	874	3558
Approach %	100.0	0.0	0.0	-	-	22.3	59.0	18.6	-	-	44.3	55.7	0.0	-	-	0.1	75.4	24.5	-	-	-
Total %	0.0	0.0	0.0	-	0.0	9.3	24.7	7.8	-	41.8	14.9	18.7	0.0	-	33.6	0.0	18.5	6.0	-	24.6	-
Lights	1	0	0	-	1	326	855	273	-	1454	503	656	0	-	1159	1	637	187	-	825	3439
% Lights	100.0	-	-	-	100.0	98.2	97.4	98.6	-	97.8	94.9	98.5	-	-	96.9	100.0	96.7	87.4	-	94.4	96.7
Mediums	0	0	0	-	0	5	20	3	-	28	25	10	0	-	35	0	20	26	-	46	109
% Mediums	0.0	-	-	-	0.0	1.5	2.3	1.1	-	1.9	4.7	1.5	-	-	2.9	0.0	3.0	12.1	-	5.3	3.1
Articulated Trucks	0	0	0	-	0	1	3	1	-	5	2	0	0	-	2	0	2	1	-	3	10
% Articulated Trucks	0.0	-	-	-	0.0	0.3	0.3	0.4	-	0.3	0.4	0.0	-	-	0.2	0.0	0.3	0.5	-	0.3	0.3
Pedestrians	-	-	-	279	-	-	-	-	748	-	-	-	-	590	-	-	-	-	434	-	-
% Pedestrians	-	-	-	100.0	-	-	-	-	100.0	-	-	-	-	100.0	-	-	-	-	100.0	-	-

Progressive AE
1811 4 Mile Rd NE

Grand Rapids, Michigan, United States 49525
(616) 361-2664

Count Name: Union St at Front St
Site Code:
Start Date: 07/20/2021

Turning Movement Peak Hour Data (8:00 AM)

Start Time	Front St Eastbound					Front St Westbound					Union St Northbound					Union St Southbound					
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
8:00 AM	0	0	0	4	0	19	53	12	21	84	28	28	0	7	56	0	35	14	3	49	189
8:15 AM	0	0	0	8	0	13	34	10	5	57	31	22	0	5	53	0	28	12	5	40	150
8:30 AM	1	0	0	16	1	23	49	6	6	78	28	24	0	17	52	0	39	12	3	51	182
8:45 AM	0	0	0	13	0	16	45	15	12	76	47	38	0	7	85	0	45	16	7	61	222
Total	1	0	0	41	1	71	181	43	44	295	134	112	0	36	246	0	147	54	18	201	743
Approach %	100.0	0.0	0.0	-	-	24.1	61.4	14.6	-	-	54.5	45.5	0.0	-	-	0.0	73.1	26.9	-	-	-
Total %	0.1	0.0	0.0	-	0.1	9.6	24.4	5.8	-	39.7	18.0	15.1	0.0	-	33.1	0.0	19.8	7.3	-	27.1	-
PHF	0.250	0.000	0.000	-	0.250	0.772	0.854	0.717	-	0.878	0.713	0.737	0.000	-	0.724	0.000	0.817	0.844	-	0.824	0.837
Lights	1	0	0	-	1	67	173	40	-	280	126	109	0	-	235	0	143	48	-	191	707
% Lights	100.0	-	-	-	100.0	94.4	95.6	93.0	-	94.9	94.0	97.3	-	-	95.5	-	97.3	88.9	-	95.0	95.2
Mediums	0	0	0	-	0	3	7	2	-	12	6	3	0	-	9	0	3	6	-	9	30
% Mediums	0.0	-	-	-	0.0	4.2	3.9	4.7	-	4.1	4.5	2.7	-	-	3.7	-	2.0	11.1	-	4.5	4.0
Articulated Trucks	0	0	0	-	0	1	1	1	-	3	2	0	0	-	2	0	1	0	-	1	6
% Articulated Trucks	0.0	-	-	-	0.0	1.4	0.6	2.3	-	1.0	1.5	0.0	-	-	0.8	-	0.7	0.0	-	0.5	0.8
Pedestrians	-	-	-	41	-	-	-	-	44	-	-	-	-	36	-	-	-	-	18	-	-
% Pedestrians	-	-	-	100.0	-	-	-	-	100.0	-	-	-	-	100.0	-	-	-	-	100.0	-	-

Progressive AE
1811 4 Mile Rd NE

Grand Rapids, Michigan, United States 49525
(616) 361-2664

Count Name: Union St at Front St
Site Code:
Start Date: 07/20/2021

Turning Movement Peak Hour Data (4:30 PM)

Start Time	Front St Eastbound					Front St Westbound					Union St Northbound					Union St Southbound					
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
4:30 PM	0	0	0	22	0	22	76	28	80	126	35	58	0	61	93	0	63	14	60	77	296
4:45 PM	0	0	0	24	0	32	53	29	94	114	38	51	0	66	89	0	65	18	46	83	286
5:00 PM	0	0	0	14	0	33	83	23	71	139	43	70	0	55	113	0	37	20	51	57	309
5:15 PM	0	0	0	24	0	33	98	26	58	157	43	65	0	85	108	0	39	11	35	50	315
Total	0	0	0	84	0	120	310	106	303	536	159	244	0	267	403	0	204	63	192	267	1206
Approach %	0.0	0.0	0.0	-	-	22.4	57.8	19.8	-	-	39.5	60.5	0.0	-	-	0.0	76.4	23.6	-	-	-
Total %	0.0	0.0	0.0	-	0.0	10.0	25.7	8.8	-	44.4	13.2	20.2	0.0	-	33.4	0.0	16.9	5.2	-	22.1	-
PHF	0.000	0.000	0.000	-	0.000	0.909	0.791	0.914	-	0.854	0.924	0.871	0.000	-	0.892	0.000	0.785	0.788	-	0.804	0.957
Lights	0	0	0	-	0	119	303	105	-	527	153	243	0	-	396	0	198	59	-	257	1180
% Lights	-	-	-	-	-	99.2	97.7	99.1	-	98.3	96.2	99.6	-	-	98.3	-	97.1	93.7	-	96.3	97.8
Mediums	0	0	0	-	0	1	7	1	-	9	6	1	0	-	7	0	6	4	-	10	26
% Mediums	-	-	-	-	-	0.8	2.3	0.9	-	1.7	3.8	0.4	-	-	1.7	-	2.9	6.3	-	3.7	2.2
Articulated Trucks	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Articulated Trucks	-	-	-	-	-	0.0	0.0	0.0	-	0.0	0.0	0.0	-	-	0.0	-	0.0	0.0	-	0.0	0.0
Pedestrians	-	-	-	84	-	-	-	-	303	-	-	-	-	267	-	-	-	-	192	-	-
% Pedestrians	-	-	-	100.0	-	-	-	-	100.0	-	-	-	-	100.0	-	-	-	-	100.0	-	-

Progressive AE
1811 4 Mile Rd NE

Grand Rapids, Michigan, United States 49525
(616) 361-2664

Count Name: Union St at Front St
Site Code:
Start Date: 03/02/2023

Turning Movement Data

03/02/2023	Front St Eastbound		Front St Westbound					Union St Northbound				Union St Southbound				
	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Thru	Right	Peds	App. Total	Int. Total
7:00 AM	0	0	2	9	3	0	14	3	2	0	5	20	12	0	32	51
7:15 AM	2	0	6	26	11	0	43	2	3	1	5	19	9	2	28	76
7:30 AM	1	0	6	29	11	0	46	2	5	2	7	40	11	0	51	104
7:45 AM	1	0	4	39	14	0	57	3	6	1	9	26	8	1	34	100
Hourly Total	4	0	18	103	39	0	160	10	16	4	26	105	40	3	145	331
8:00 AM	0	0	3	39	9	6	51	6	7	8	13	15	16	1	31	95
8:15 AM	1	0	2	32	14	3	48	7	9	0	16	23	6	4	29	93
8:30 AM	3	0	8	23	12	0	43	6	6	7	12	27	7	2	34	89
8:45 AM	2	0	4	34	17	1	55	2	5	3	7	38	6	5	44	106
Hourly Total	6	0	17	128	52	10	197	21	27	18	48	103	35	12	138	383
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4:00 PM	1	0	13	47	24	4	84	5	19	3	24	23	12	5	35	143
4:15 PM	3	0	27	59	29	5	115	8	12	5	20	21	9	7	30	165
4:30 PM	2	0	9	45	30	8	84	8	20	8	28	30	20	7	50	162
4:45 PM	4	0	17	49	21	11	87	7	21	5	28	35	8	5	43	158
Hourly Total	10	0	66	200	104	28	370	28	72	21	100	109	49	24	158	628
5:00 PM	2	0	23	49	33	9	105	6	36	7	42	31	20	9	51	198
5:15 PM	2	0	14	54	23	11	91	7	30	12	37	25	12	12	37	165
5:30 PM	10	0	20	44	40	11	104	3	31	9	34	29	13	8	42	180
5:45 PM	2	0	18	43	31	6	92	2	20	9	22	26	11	12	37	151
Hourly Total	16	0	75	190	127	37	392	18	117	37	135	111	56	41	167	694
03/03/2023	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11:00 AM	4	0	10	65	18	7	93	10	9	9	19	21	10	10	31	143
11:15 AM	2	0	13	62	20	6	95	7	14	11	21	24	12	9	36	152
11:30 AM	7	0	19	53	23	9	95	5	14	8	19	31	13	10	44	158
11:45 AM	4	0	18	58	19	13	95	13	21	12	34	28	19	14	47	176
Hourly Total	17	0	60	238	80	35	378	35	58	40	93	104	54	43	158	629
12:00 PM	4	0	28	49	21	8	98	9	15	13	24	39	12	9	51	173
12:15 PM	2	0	23	62	28	18	113	10	13	9	23	27	10	10	37	173
12:30 PM	4	0	24	66	21	17	111	3	15	10	18	24	12	14	36	165
12:45 PM	5	0	19	55	28	21	102	12	18	24	30	20	19	8	39	171
Hourly Total	15	0	94	232	98	64	424	34	61	56	95	110	53	41	163	682
1:00 PM	13	0	18	63	23	16	104	8	8	19	16	19	13	11	32	152
1:15 PM	6	0	23	72	33	11	128	10	8	25	18	23	11	2	34	180
1:30 PM	13	0	20	59	32	9	111	5	10	22	15	33	11	13	44	170
1:45 PM	9	0	14	68	25	23	107	12	10	14	22	32	8	11	40	169
Hourly Total	41	0	75	262	113	59	450	35	36	80	71	107	43	37	150	671
2:00 PM	4	0	17	56	19	20	92	11	13	5	24	29	9	5	38	154
2:15 PM	2	0	16	67	30	15	113	8	23	17	31	23	10	8	33	177
2:30 PM	7	0	12	47	22	14	81	8	13	8	21	31	13	13	44	146
2:45 PM	17	0	14	62	26	25	102	11	13	23	24	21	9	23	30	156
Hourly Total	30	0	59	232	97	74	388	38	62	53	100	104	41	49	145	633
3:00 PM	11	0	12	51	34	12	97	6	11	29	17	24	13	16	37	151
3:15 PM	3	0	16	56	22	6	94	5	15	17	20	23	15	5	38	152
3:30 PM	6	0	18	45	22	19	85	15	10	13	25	16	14	8	30	140
3:45 PM	6	0	25	52	29	17	106	9	23	17	32	22	13	12	35	173
Hourly Total	26	0	71	204	107	54	382	35	59	76	94	85	55	41	140	616
4:00 PM	2	0	20	63	23	17	106	6	12	17	18	35	12	1	47	171
4:15 PM	5	0	18	49	28	9	95	7	6	17	13	18	11	6	29	137
4:30 PM	13	0	24	61	24	11	109	5	21	9	26	29	7	15	36	171
4:45 PM	22	0	27	52	30	11	109	3	13	8	16	37	19	12	56	181
Hourly Total	42	0	89	225	105	48	419	21	52	51	73	119	49	34	168	660
5:00 PM	12	0	37	48	31	12	116	7	14	21	21	26	13	16	39	176
5:15 PM	0	0	37	54	34	18	125	6	17	15	23	19	14	7	33	181
5:30 PM	6	0	25	57	21	21	103	11	26	24	37	25	15	7	40	180
5:45 PM	17	0	21	33	22	17	76	3	13	9	16	28	9	11	37	129
Hourly Total	35	0	120	192	108	68	420	27	70	69	97	98	51	41	149	666
03/04/2023	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11:00 AM	12	0	20	44	22	22	86	11	10	23	21	27	10	27	37	144
11:15 AM	10	0	14	54	34	34	102	8	13	43	21	19	15	25	34	157

11:30 AM	18	0	19	54	28	20	101	7	16	35	23	18	6	25	24	148
11:45 AM	18	0	19	63	30	30	112	5	12	31	17	28	15	24	43	172
Hourly Total	58	0	72	215	114	106	401	31	51	132	82	92	46	101	138	621
12:00 PM	20	0	19	63	27	39	109	2	8	29	10	18	17	21	35	154
12:15 PM	19	0	24	68	21	39	113	7	13	29	20	32	13	29	45	178
12:30 PM	24	0	23	55	34	54	112	4	12	43	16	28	15	20	43	171
12:45 PM	11	0	24	56	33	45	113	4	16	46	20	24	12	21	36	169
Hourly Total	74	0	90	242	115	177	447	17	49	147	66	102	57	91	159	672
1:00 PM	18	0	21	57	37	45	115	14	22	43	36	21	18	59	39	190
1:15 PM	15	0	25	66	28	44	119	8	16	41	24	31	15	46	46	189
1:30 PM	23	0	25	51	42	40	118	7	8	46	15	21	13	42	34	167
1:45 PM	20	0	31	35	31	36	97	8	9	47	17	27	11	38	38	152
Hourly Total	76	0	102	209	138	165	449	37	55	177	92	100	57	185	157	698
2:00 PM	17	0	18	37	16	31	71	2	24	47	26	19	12	35	31	128
2:15 PM	13	0	17	47	39	44	103	7	14	56	21	21	9	41	30	154
2:30 PM	15	0	21	50	33	39	104	10	15	49	25	23	14	27	37	166
2:45 PM	13	0	26	54	33	48	113	1	9	33	10	20	14	28	34	157
Hourly Total	58	0	82	188	121	162	391	20	62	185	82	83	49	131	132	605
3:00 PM	11	0	32	55	26	44	113	4	12	40	16	18	11	19	29	158
3:15 PM	9	0	26	64	36	42	126	5	13	32	18	17	17	23	34	178
3:30 PM	13	0	15	55	25	48	95	4	20	33	24	25	15	12	40	159
3:45 PM	8	0	16	38	28	27	82	13	15	30	28	28	11	26	39	149
Hourly Total	41	0	89	212	115	161	416	26	60	135	86	88	54	80	142	644
4:00 PM	16	0	26	45	28	33	99	12	12	39	24	16	19	14	35	158
4:15 PM	7	0	23	51	32	35	106	3	11	34	14	25	13	24	38	158
4:30 PM	23	0	32	55	45	43	132	8	17	41	25	22	14	29	36	193
4:45 PM	8	0	22	50	28	34	100	6	10	49	16	32	11	24	43	159
Hourly Total	54	0	103	201	133	145	437	29	50	163	79	95	57	91	152	668
5:00 PM	17	0	22	45	24	30	91	5	10	34	15	31	7	18	38	144
5:15 PM	7	0	19	51	25	38	95	5	13	29	18	35	8	26	43	156
5:30 PM	16	0	21	35	34	39	90	2	12	35	14	29	14	38	43	147
5:45 PM	19	0	34	37	29	31	100	8	6	27	14	25	8	25	33	147
Hourly Total	59	0	96	168	112	138	376	20	41	125	61	120	37	107	157	594
Grand Total	662	0	1378	3641	1878	1531	6897	482	998	1569	1480	1835	883	1152	2718	11095
Approach %	-	-	20.0	52.8	27.2	-	-	32.6	67.4	-	-	67.5	32.5	-	-	-
Total %	-	0.0	12.4	32.8	16.9	-	62.2	4.3	9.0	-	13.3	16.5	8.0	-	24.5	-
Lights	-	0	1367	3488	1847	-	6702	477	984	-	1461	1768	804	-	2572	10735
% Lights	-	-	99.2	95.8	98.3	-	97.2	99.0	98.6	-	98.7	96.3	91.1	-	94.6	96.8
Mediums	-	0	8	145	30	-	183	5	13	-	18	67	78	-	145	346
% Mediums	-	-	0.6	4.0	1.6	-	2.7	1.0	1.3	-	1.2	3.7	8.8	-	5.3	3.1
Articulated Trucks	-	0	3	8	1	-	12	0	1	-	1	0	1	-	1	14
% Articulated Trucks	-	-	0.2	0.2	0.1	-	0.2	0.0	0.1	-	0.1	0.0	0.1	-	0.0	0.1
Pedestrians	662	-	-	-	-	1531	-	-	-	1569	-	-	-	1152	-	-
% Pedestrians	100.0	-	-	-	-	100.0	-	-	-	100.0	-	-	-	100.0	-	-

Progressive AE
1811 4 Mile Rd NE

Grand Rapids, Michigan, United States 49525
(616) 361-2664

Count Name: Union St at Front St
Site Code:
Start Date: 03/02/2023

Turning Movement Peak Hour Data (7:30 AM)

03/02/2023	Front St Eastbound		Front St Westbound					Union St Northbound				Union St Southbound				
	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Thru	Right	Peds	App. Total	Int. Total
7:30 AM	1	0	6	29	11	0	46	2	5	2	7	40	11	0	51	104
7:45 AM	1	0	4	39	14	0	57	3	6	1	9	26	8	1	34	100
8:00 AM	0	0	3	39	9	6	51	6	7	8	13	15	16	1	31	95
8:15 AM	1	0	2	32	14	3	48	7	9	0	16	23	6	4	29	93
Total	3	0	15	139	48	9	202	18	27	11	45	104	41	6	145	392
Approach %	-	-	7.4	68.8	23.8	-	-	40.0	60.0	-	-	71.7	28.3	-	-	-
Total %	-	0.0	3.8	35.5	12.2	-	51.5	4.6	6.9	-	11.5	26.5	10.5	-	37.0	-
PHF	-	0.000	0.625	0.891	0.857	-	0.886	0.643	0.750	-	0.703	0.650	0.641	-	0.711	0.942
Lights	-	0	13	125	43	-	181	17	27	-	44	100	37	-	137	362
% Lights	-	-	86.7	89.9	89.6	-	89.6	94.4	100.0	-	97.8	96.2	90.2	-	94.5	92.3
Mediums	-	0	1	12	5	-	18	1	0	-	1	4	4	-	8	27
% Mediums	-	-	6.7	8.6	10.4	-	8.9	5.6	0.0	-	2.2	3.8	9.8	-	5.5	6.9
Articulated Trucks	-	0	1	2	0	-	3	0	0	-	0	0	0	-	0	3
% Articulated Trucks	-	-	6.7	1.4	0.0	-	1.5	0.0	0.0	-	0.0	0.0	0.0	-	0.0	0.8
Pedestrians	3	-	-	-	-	9	-	-	-	11	-	-	-	6	-	-
% Pedestrians	100.0	-	-	-	-	100.0	-	-	-	100.0	-	-	-	100.0	-	-

Turning Movement Peak Hour Data (4:45 PM)

03/02/2023	Front St Eastbound		Front St Westbound					Union St Northbound				Union St Southbound				
	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Thru	Right	Peds	App. Total	Int. Total
4:45 PM	4	0	17	49	21	11	87	7	21	5	28	35	8	5	43	158
5:00 PM	2	0	23	49	33	9	105	6	36	7	42	31	20	9	51	198
5:15 PM	2	0	14	54	23	11	91	7	30	12	37	25	12	12	37	165
5:30 PM	10	0	20	44	40	11	104	3	31	9	34	29	13	8	42	180
Total	18	0	74	196	117	42	387	23	118	33	141	120	53	34	173	701
Approach %	-	-	19.1	50.6	30.2	-	-	16.3	83.7	-	-	69.4	30.6	-	-	-
Total %	-	0.0	10.6	28.0	16.7	-	55.2	3.3	16.8	-	20.1	17.1	7.6	-	24.7	-
PHF	-	0.000	0.804	0.907	0.731	-	0.921	0.821	0.819	-	0.839	0.857	0.663	-	0.848	0.885
Lights	-	0	74	185	116	-	375	23	117	-	140	116	47	-	163	678
% Lights	-	-	100.0	94.4	99.1	-	96.9	100.0	99.2	-	99.3	96.7	88.7	-	94.2	96.7
Mediums	-	0	0	10	1	-	11	0	1	-	1	4	6	-	10	22
% Mediums	-	-	0.0	5.1	0.9	-	2.8	0.0	0.8	-	0.7	3.3	11.3	-	5.8	3.1
Articulated Trucks	-	0	0	1	0	-	1	0	0	-	0	0	0	-	0	1
% Articulated Trucks	-	-	0.0	0.5	0.0	-	0.3	0.0	0.0	-	0.0	0.0	0.0	-	0.0	0.1
Pedestrians	18	-	-	-	-	42	-	-	-	33	-	-	-	34	-	-
% Pedestrians	100.0	-	-	-	-	100.0	-	-	-	100.0	-	-	-	100.0	-	-

Progressive AE
1811 4 Mile Rd NE

Grand Rapids, Michigan, United States 49525
(616) 361-2664

Count Name: Union St at Front St
Site Code:
Start Date: 03/02/2023

Turning Movement Peak Hour Data (4:45 PM)

03/03/2023	Front St Eastbound		Front St Westbound					Union St Northbound				Union St Southbound				
	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Thru	Right	Peds	App. Total	Int. Total
4:45 PM	22	0	27	52	30	11	109	3	13	8	16	37	19	12	56	181
5:00 PM	12	0	37	48	31	12	116	7	14	21	21	26	13	16	39	176
5:15 PM	0	0	37	54	34	18	125	6	17	15	23	19	14	7	33	181
5:30 PM	6	0	25	57	21	21	103	11	26	24	37	25	15	7	40	180
Total	40	0	126	211	116	62	453	27	70	68	97	107	61	42	168	718
Approach %	-	-	27.8	46.6	25.6	-	-	27.8	72.2	-	-	63.7	36.3	-	-	-
Total %	-	0.0	17.5	29.4	16.2	-	63.1	3.8	9.7	-	13.5	14.9	8.5	-	23.4	-
PHF	-	0.000	0.851	0.925	0.853	-	0.906	0.614	0.673	-	0.655	0.723	0.803	-	0.750	0.992
Lights	-	0	126	199	114	-	439	27	70	-	97	104	56	-	160	696
% Lights	-	-	100.0	94.3	98.3	-	96.9	100.0	100.0	-	100.0	97.2	91.8	-	95.2	96.9
Mediums	-	0	0	11	2	-	13	0	0	-	0	3	5	-	8	21
% Mediums	-	-	0.0	5.2	1.7	-	2.9	0.0	0.0	-	0.0	2.8	8.2	-	4.8	2.9
Articulated Trucks	-	0	0	1	0	-	1	0	0	-	0	0	0	-	0	1
% Articulated Trucks	-	-	0.0	0.5	0.0	-	0.2	0.0	0.0	-	0.0	0.0	0.0	-	0.0	0.1
Pedestrians	40	-	-	-	-	62	-	-	-	68	-	-	-	42	-	-
% Pedestrians	100.0	-	-	-	-	100.0	-	-	-	100.0	-	-	-	100.0	-	-

Turning Movement Peak Hour Data (12:30 PM)

03/04/2023	Front St Eastbound		Front St Westbound					Union St Northbound				Union St Southbound				
	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Thru	Right	Peds	App. Total	Int. Total
12:30 PM	24	0	23	55	34	54	112	4	12	43	16	28	15	20	43	171
12:45 PM	11	0	24	56	33	45	113	4	16	46	20	24	12	21	36	169
1:00 PM	18	0	21	57	37	45	115	14	22	43	36	21	18	59	39	190
1:15 PM	15	0	25	66	28	44	119	8	16	41	24	31	15	46	46	189
Total	68	0	93	234	132	188	459	30	66	173	96	104	60	146	164	719
Approach %	-	-	20.3	51.0	28.8	-	-	31.3	68.8	-	-	63.4	36.6	-	-	-
Total %	-	0.0	12.9	32.5	18.4	-	63.8	4.2	9.2	-	13.4	14.5	8.3	-	22.8	-
PHF	-	0.000	0.930	0.886	0.892	-	0.964	0.536	0.750	-	0.667	0.839	0.833	-	0.891	0.946
Lights	-	0	93	230	132	-	455	30	66	-	96	102	57	-	159	710
% Lights	-	-	100.0	98.3	100.0	-	99.1	100.0	100.0	-	100.0	98.1	95.0	-	97.0	98.7
Mediums	-	0	0	4	0	-	4	0	0	-	0	2	3	-	5	9
% Mediums	-	-	0.0	1.7	0.0	-	0.9	0.0	0.0	-	0.0	1.9	5.0	-	3.0	1.3
Articulated Trucks	-	0	0	0	0	-	0	0	0	-	0	0	0	-	0	0
% Articulated Trucks	-	-	0.0	0.0	0.0	-	0.0	0.0	0.0	-	0.0	0.0	0.0	-	0.0	0.0
Pedestrians	68	-	-	-	-	188	-	-	-	173	-	-	-	146	-	-
% Pedestrians	100.0	-	-	-	-	100.0	-	-	-	100.0	-	-	-	100.0	-	-

Progressive AE
1811 4 Mile Rd NE

Grand Rapids, Michigan, United States 49525
(616) 361-2664

Count Name: Union St at Front St
Site Code:
Start Date: 05/18/2023

Turning Movement Data

05/18/2023	Front St Eastbound		Front St Westbound					Union St Northbound				Union St Southbound				
	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Thru	Right	Peds	App. Total	Int. Total
7:00 AM	0	0	2	16	12	1	30	1	1	0	2	18	7	1	25	57
7:15 AM	0	0	1	29	11	2	41	3	4	2	7	30	10	1	40	88
7:30 AM	1	0	4	25	12	0	41	2	12	6	14	26	21	5	47	102
7:45 AM	4	0	4	34	11	1	49	5	7	8	12	29	12	4	41	102
Hourly Total	5	0	11	104	46	4	161	11	24	16	35	103	50	11	153	349
8:00 AM	4	0	5	32	12	2	49	7	8	2	15	24	21	10	45	109
8:15 AM	5	0	7	48	15	2	70	7	10	3	17	34	18	9	52	139
8:30 AM	7	0	8	25	17	5	50	7	5	6	12	24	14	5	38	100
8:45 AM	6	0	7	34	14	1	55	8	6	12	14	28	15	3	43	112
Hourly Total	22	0	27	139	58	10	224	29	29	23	58	110	68	27	178	460
05/18/2023	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4:00 PM	7	0	12	56	28	17	96	6	20	28	26	45	10	23	55	177
4:15 PM	4	0	21	41	28	18	90	7	21	13	28	29	13	11	42	160
4:30 PM	6	0	19	51	43	14	113	5	19	49	24	32	17	21	49	186
4:45 PM	9	0	26	66	37	21	129	6	19	24	25	38	8	21	46	200
Hourly Total	26	0	78	214	136	70	428	24	79	114	103	144	48	76	192	723
5:00 PM	9	0	28	65	36	27	129	6	22	15	28	40	17	19	57	214
5:15 PM	2	0	18	47	28	24	93	3	18	14	21	34	8	7	42	156
5:30 PM	6	0	21	54	26	25	101	2	20	44	22	24	14	14	38	161
5:45 PM	15	0	24	53	28	25	105	7	15	28	22	21	11	47	32	159
Hourly Total	32	0	91	219	118	101	428	18	75	101	93	119	50	87	169	690
05/19/2023	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11:00 AM	4	0	18	77	26	15	121	10	8	21	18	27	10	12	37	176
11:15 AM	9	0	24	53	24	33	101	14	13	17	27	25	23	7	48	176
11:30 AM	12	0	29	59	22	18	110	14	17	29	31	35	16	9	51	192
11:45 AM	11	0	32	57	35	24	124	10	16	33	26	28	17	17	45	195
Hourly Total	36	0	103	246	107	90	456	48	54	100	102	115	66	45	181	739
12:00 PM	14	0	22	61	26	29	109	8	19	36	27	25	17	22	42	178
12:15 PM	18	0	30	70	34	21	134	16	14	8	30	34	19	38	53	217
12:30 PM	8	0	32	69	37	26	138	10	17	32	27	34	26	37	60	225
12:45 PM	14	0	22	71	27	28	120	8	8	34	16	24	14	32	38	174
Hourly Total	54	0	106	271	124	104	501	42	58	110	100	117	76	129	193	794
1:00 PM	19	0	31	66	31	44	128	11	11	17	22	37	11	30	48	198
1:15 PM	21	0	27	58	39	24	124	10	18	21	28	27	17	17	44	196
1:30 PM	27	0	36	54	41	23	131	7	20	32	27	27	16	43	43	201
1:45 PM	8	0	30	79	41	18	150	13	28	28	41	35	10	23	45	236
Hourly Total	75	0	124	257	152	109	533	41	77	98	118	126	54	113	180	831
2:00 PM	6	0	28	63	34	31	125	11	18	32	29	28	14	44	42	196
2:15 PM	9	0	25	68	27	37	120	3	21	27	24	24	17	19	41	185
2:30 PM	22	0	19	66	31	42	116	7	13	31	20	33	19	34	52	188
2:45 PM	12	0	14	65	25	47	104	9	35	49	44	31	21	42	52	200
Hourly Total	49	0	86	262	117	157	465	30	87	139	117	116	71	139	187	769
3:00 PM	13	0	17	72	43	17	132	16	21	24	37	35	10	28	45	214
3:15 PM	19	0	18	82	48	36	148	12	21	24	33	27	16	37	43	224
3:30 PM	14	0	17	55	35	28	107	7	24	28	31	30	12	21	42	180
3:45 PM	19	0	22	62	37	37	121	5	20	28	25	31	15	32	46	192
Hourly Total	65	0	74	271	163	118	508	40	86	104	126	123	53	118	176	810
4:00 PM	15	0	15	50	29	18	94	8	14	23	22	30	12	25	42	158
4:15 PM	9	0	29	65	31	36	125	11	14	32	25	39	13	36	52	202
4:30 PM	19	0	29	63	35	24	127	7	15	19	22	34	17	23	51	200
4:45 PM	15	0	19	58	26	37	103	7	11	42	18	33	7	13	40	161
Hourly Total	58	0	92	236	121	115	449	33	54	116	87	136	49	97	185	721
5:00 PM	7	0	24	58	44	32	126	6	34	25	40	42	7	11	49	215
5:15 PM	6	0	27	59	35	32	121	5	16	23	21	31	14	29	45	187
5:30 PM	24	0	24	43	43	33	110	1	13	37	14	36	17	39	53	177
5:45 PM	19	0	20	49	37	35	106	6	12	48	18	29	16	40	45	169
Hourly Total	56	0	95	209	159	132	463	18	75	133	93	138	54	119	192	748
05/20/2023	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11:00 AM	24	0	29	55	44	21	128	4	12	22	16	30	17	39	47	191
11:15 AM	16	0	26	52	29	29	107	13	12	26	25	30	26	24	56	188

11:30 AM	32	0	29	67	34	51	130	11	12	33	23	28	13	43	41	194
11:45 AM	30	0	21	70	44	52	135	5	12	47	17	44	25	52	69	221
Hourly Total	102	0	105	244	151	153	500	33	48	128	81	132	81	158	213	794
12:00 PM	29	0	33	60	37	35	130	4	19	54	23	27	21	67	48	201
12:15 PM	11	0	31	61	24	43	116	6	11	33	17	40	9	31	49	182
12:30 PM	20	0	33	62	27	43	122	8	24	50	32	29	20	33	49	203
12:45 PM	18	0	23	67	32	34	122	3	14	53	17	26	11	50	37	176
Hourly Total	78	0	120	250	120	155	490	21	68	190	89	122	61	181	183	762
1:00 PM	23	0	17	54	38	62	109	4	21	66	25	37	16	56	53	187
1:15 PM	45	0	24	63	25	45	112	5	13	47	18	27	15	75	42	172
1:30 PM	33	0	22	57	50	43	129	3	17	53	20	31	11	53	42	191
1:45 PM	35	0	23	43	23	46	89	8	12	76	20	34	10	47	44	153
Hourly Total	136	0	86	217	136	196	439	20	63	242	83	129	52	231	181	703
2:00 PM	30	0	21	53	37	62	111	6	19	46	25	25	12	73	37	173
2:15 PM	25	0	28	51	31	87	110	11	13	55	24	20	12	46	32	166
2:30 PM	32	0	22	63	38	86	123	1	11	56	12	20	12	68	32	167
2:45 PM	35	0	23	50	29	72	102	2	11	64	13	19	9	52	28	143
Hourly Total	122	0	94	217	135	307	446	20	54	221	74	84	45	239	129	649
3:00 PM	12	0	18	50	38	42	106	7	12	51	19	13	7	34	20	145
3:15 PM	6	0	17	58	31	39	106	5	10	31	15	22	8	42	30	151
3:30 PM	40	0	16	54	30	63	100	7	20	32	27	33	11	59	44	171
3:45 PM	38	0	16	71	25	47	112	4	12	36	16	28	10	68	38	166
Hourly Total	96	0	67	233	124	191	424	23	54	150	77	96	36	203	132	633
4:00 PM	20	0	11	53	34	37	98	6	10	47	16	23	11	62	34	148
4:15 PM	14	0	14	64	41	58	119	5	8	27	13	22	17	44	39	171
4:30 PM	15	0	11	43	30	63	84	1	12	42	13	21	15	43	36	133
4:45 PM	35	0	24	55	30	40	109	5	10	39	15	28	12	50	40	164
Hourly Total	84	0	60	215	135	198	410	17	40	155	57	94	55	199	149	616
5:00 PM	33	0	23	56	34	59	113	1	14	50	15	29	7	46	36	164
5:15 PM	31	0	13	48	27	49	88	8	7	67	15	29	14	47	43	146
5:30 PM	25	0	18	43	36	48	97	2	18	77	20	23	9	23	32	149
5:45 PM	22	0	14	51	26	50	91	3	16	45	19	24	16	36	40	150
Hourly Total	111	0	68	198	123	206	389	14	55	239	69	105	46	152	151	609
Grand Total	1207	0	1487	4002	2225	2416	7714	482	1080	2379	1562	2109	1015	2324	3124	12400
Approach %	-	-	19.3	51.9	28.8	-	-	30.9	69.1	-	-	67.5	32.5	-	-	-
Total %	-	0.0	12.0	32.3	17.9	-	62.2	3.9	8.7	-	12.6	17.0	8.2	-	25.2	-
Lights	-	0	1474	3845	2196	-	7515	473	1070	-	1543	2037	932	-	2969	12027
% Lights	-	-	99.1	96.1	98.7	-	97.4	98.1	99.1	-	98.8	96.6	91.8	-	95.0	97.0
Mediums	-	0	11	151	23	-	185	8	8	-	16	68	83	-	151	352
% Mediums	-	-	0.7	3.8	1.0	-	2.4	1.7	0.7	-	1.0	3.2	8.2	-	4.8	2.8
Articulated Trucks	-	0	2	6	6	-	14	1	2	-	3	4	0	-	4	21
% Articulated Trucks	-	-	0.1	0.1	0.3	-	0.2	0.2	0.2	-	0.2	0.2	0.0	-	0.1	0.2
Pedestrians	1207	-	-	-	-	2416	-	-	-	2379	-	-	-	2324	-	-
% Pedestrians	100.0	-	-	-	-	100.0	-	-	-	100.0	-	-	-	100.0	-	-

Progressive AE
1811 4 Mile Rd NE

Grand Rapids, Michigan, United States 49525
(616) 361-2664

Count Name: Union St at Front St
Site Code:
Start Date: 05/18/2023

Turning Movement Peak Hour Data (8:00 AM)

05/18/2023	Front St Eastbound		Front St Westbound					Union St Northbound				Union St Southbound				
	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Thru	Right	Peds	App. Total	Int. Total
8:00 AM	4	0	5	32	12	2	49	7	8	2	15	24	21	10	45	109
8:15 AM	5	0	7	48	15	2	70	7	10	3	17	34	18	9	52	139
8:30 AM	7	0	8	25	17	5	50	7	5	6	12	24	14	5	38	100
8:45 AM	6	0	7	34	14	1	55	8	6	12	14	28	15	3	43	112
Total	22	0	27	139	58	10	224	29	29	23	58	110	68	27	178	460
Approach %	-	-	12.1	62.1	25.9	-	-	50.0	50.0	-	-	61.8	38.2	-	-	-
Total %	-	0.0	5.9	30.2	12.6	-	48.7	6.3	6.3	-	12.6	23.9	14.8	-	38.7	-
PHF	-	0.000	0.844	0.724	0.853	-	0.800	0.906	0.725	-	0.853	0.809	0.810	-	0.856	0.827
Lights	-	0	26	129	55	-	210	28	27	-	55	105	63	-	168	433
% Lights	-	-	96.3	92.8	94.8	-	93.8	96.6	93.1	-	94.8	95.5	92.6	-	94.4	94.1
Mediums	-	0	0	10	3	-	13	1	1	-	2	3	5	-	8	23
% Mediums	-	-	0.0	7.2	5.2	-	5.8	3.4	3.4	-	3.4	2.7	7.4	-	4.5	5.0
Articulated Trucks	-	0	1	0	0	-	1	0	1	-	1	2	0	-	2	4
% Articulated Trucks	-	-	3.7	0.0	0.0	-	0.4	0.0	3.4	-	1.7	1.8	0.0	-	1.1	0.9
Pedestrians	22	-	-	-	-	10	-	-	-	23	-	-	-	27	-	-
% Pedestrians	100.0	-	-	-	-	100.0	-	-	-	100.0	-	-	-	100.0	-	-

Turning Movement Peak Hour Data (4:15 PM)

05/18/2023	Front St Eastbound		Front St Westbound					Union St Northbound				Union St Southbound				
	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Thru	Right	Peds	App. Total	Int. Total
4:15 PM	4	0	21	41	28	18	90	7	21	13	28	29	13	11	42	160
4:30 PM	6	0	19	51	43	14	113	5	19	49	24	32	17	21	49	186
4:45 PM	9	0	26	66	37	21	129	6	19	24	25	38	8	21	46	200
5:00 PM	9	0	28	65	36	27	129	6	22	15	28	40	17	19	57	214
Total	28	0	94	223	144	80	461	24	81	101	105	139	55	72	194	760
Approach %	-	-	20.4	48.4	31.2	-	-	22.9	77.1	-	-	71.6	28.4	-	-	-
Total %	-	0.0	12.4	29.3	18.9	-	60.7	3.2	10.7	-	13.8	18.3	7.2	-	25.5	-
PHF	-	0.000	0.839	0.845	0.837	-	0.893	0.857	0.920	-	0.938	0.869	0.809	-	0.851	0.888
Lights	-	0	94	213	143	-	450	24	80	-	104	137	50	-	187	741
% Lights	-	-	100.0	95.5	99.3	-	97.6	100.0	98.8	-	99.0	98.6	90.9	-	96.4	97.5
Mediums	-	0	0	10	1	-	11	0	1	-	1	2	5	-	7	19
% Mediums	-	-	0.0	4.5	0.7	-	2.4	0.0	1.2	-	1.0	1.4	9.1	-	3.6	2.5
Articulated Trucks	-	0	0	0	0	-	0	0	0	-	0	0	0	-	0	0
% Articulated Trucks	-	-	0.0	0.0	0.0	-	0.0	0.0	0.0	-	0.0	0.0	0.0	-	0.0	0.0
Pedestrians	28	-	-	-	-	80	-	-	-	101	-	-	-	72	-	-
% Pedestrians	100.0	-	-	-	-	100.0	-	-	-	100.0	-	-	-	100.0	-	-

Progressive AE
1811 4 Mile Rd NE

Grand Rapids, Michigan, United States 49525
(616) 361-2664

Count Name: Union St at Front St
Site Code:
Start Date: 05/18/2023

Turning Movement Peak Hour Data (1:00 PM)

05/19/2023	Front St Eastbound		Front St Westbound					Union St Northbound				Union St Southbound				
	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Thru	Right	Peds	App. Total	Int. Total
1:00 PM	19	0	31	66	31	44	128	11	11	17	22	37	11	30	48	198
1:15 PM	21	0	27	58	39	24	124	10	18	21	28	27	17	17	44	196
1:30 PM	27	0	36	54	41	23	131	7	20	32	27	27	16	43	43	201
1:45 PM	8	0	30	79	41	18	150	13	28	28	41	35	10	23	45	236
Total	75	0	124	257	152	109	533	41	77	98	118	126	54	113	180	831
Approach %	-	-	23.3	48.2	28.5	-	-	34.7	65.3	-	-	70.0	30.0	-	-	-
Total %	-	0.0	14.9	30.9	18.3	-	64.1	4.9	9.3	-	14.2	15.2	6.5	-	21.7	-
PHF	-	0.000	0.861	0.813	0.927	-	0.888	0.788	0.688	-	0.720	0.851	0.794	-	0.938	0.880
Lights	-	0	123	246	148	-	517	39	77	-	116	117	48	-	165	798
% Lights	-	-	99.2	95.7	97.4	-	97.0	95.1	100.0	-	98.3	92.9	88.9	-	91.7	96.0
Mediums	-	0	1	10	1	-	12	2	0	-	2	8	6	-	14	28
% Mediums	-	-	0.8	3.9	0.7	-	2.3	4.9	0.0	-	1.7	6.3	11.1	-	7.8	3.4
Articulated Trucks	-	0	0	1	3	-	4	0	0	-	0	1	0	-	1	5
% Articulated Trucks	-	-	0.0	0.4	2.0	-	0.8	0.0	0.0	-	0.0	0.8	0.0	-	0.6	0.6
Pedestrians	75	-	-	-	-	109	-	-	-	98	-	-	-	113	-	-
% Pedestrians	100.0	-	-	-	-	100.0	-	-	-	100.0	-	-	-	100.0	-	-

Turning Movement Peak Hour Data (11:45 AM)

05/20/2023	Front St Eastbound		Front St Westbound					Union St Northbound				Union St Southbound				
	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Thru	Right	Peds	App. Total	Int. Total
11:45 AM	30	0	21	70	44	52	135	5	12	47	17	44	25	52	69	221
12:00 PM	29	0	33	60	37	35	130	4	19	54	23	27	21	67	48	201
12:15 PM	11	0	31	61	24	43	116	6	11	33	17	40	9	31	49	182
12:30 PM	20	0	33	62	27	43	122	8	24	50	32	29	20	33	49	203
Total	90	0	118	253	132	173	503	23	66	184	89	140	75	183	215	807
Approach %	-	-	23.5	50.3	26.2	-	-	25.8	74.2	-	-	65.1	34.9	-	-	-
Total %	-	0.0	14.6	31.4	16.4	-	62.3	2.9	8.2	-	11.0	17.3	9.3	-	26.6	-
PHF	-	0.000	0.894	0.904	0.750	-	0.931	0.719	0.688	-	0.695	0.795	0.750	-	0.779	0.913
Lights	-	0	118	248	131	-	497	22	66	-	88	138	72	-	210	795
% Lights	-	-	100.0	98.0	99.2	-	98.8	95.7	100.0	-	98.9	98.6	96.0	-	97.7	98.5
Mediums	-	0	0	5	1	-	6	1	0	-	1	2	3	-	5	12
% Mediums	-	-	0.0	2.0	0.8	-	1.2	4.3	0.0	-	1.1	1.4	4.0	-	2.3	1.5
Articulated Trucks	-	0	0	0	0	-	0	0	0	-	0	0	0	-	0	0
% Articulated Trucks	-	-	0.0	0.0	0.0	-	0.0	0.0	0.0	-	0.0	0.0	0.0	-	0.0	0.0
Pedestrians	90	-	-	-	-	173	-	-	-	184	-	-	-	183	-	-
% Pedestrians	100.0	-	-	-	-	100.0	-	-	-	100.0	-	-	-	100.0	-	-

Progressive AE
1811 4 Mile Rd NE

Grand Rapids, Michigan, United States 49525
(616) 361-2664

Count Name: Union St at Front St
Site Code:
Start Date: 07/27/2023

Turning Movement Data

07/27/2023	Front St Eastbound		Front St Westbound					Union St Northbound				Union St Southbound				
	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Thru	Right	Peds	App. Total	Int. Total
7:00 AM	1	0	2	14	5	0	21	0	3	2	3	8	9	9	17	41
7:15 AM	0	0	4	23	9	1	36	4	0	4	4	9	6	1	15	55
7:30 AM	2	0	4	25	7	5	36	3	9	9	12	15	9	5	24	72
7:45 AM	5	0	5	41	4	4	50	3	9	9	12	18	8	11	26	88
Hourly Total	8	0	15	103	25	10	143	10	21	24	31	50	32	26	82	256
8:00 AM	5	0	6	32	3	4	41	6	12	5	18	26	9	4	35	94
8:15 AM	6	0	9	44	16	8	69	3	13	6	16	10	6	9	16	101
8:30 AM	8	0	9	41	17	3	67	13	11	15	24	12	8	8	20	111
8:45 AM	9	0	7	46	12	7	65	9	11	20	20	10	12	6	22	107
Hourly Total	28	0	31	163	48	22	242	31	47	46	78	58	35	27	93	413
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4:00 PM	11	0	12	72	21	48	105	5	13	53	18	17	17	27	34	157
4:15 PM	14	0	11	65	23	36	99	4	18	49	22	18	10	30	28	149
4:30 PM	12	0	21	49	19	37	89	6	21	14	27	24	17	16	41	157
4:45 PM	21	0	19	46	28	26	93	8	15	38	23	19	11	20	30	146
Hourly Total	58	0	63	232	91	147	386	23	67	154	90	78	55	93	133	609
5:00 PM	10	0	16	69	29	38	114	4	19	27	23	13	23	19	36	173
5:15 PM	9	0	15	63	23	44	101	2	19	34	21	29	14	17	43	165
5:30 PM	21	0	17	55	17	37	89	7	7	28	14	24	12	28	36	139
5:45 PM	15	0	11	49	25	42	85	3	12	40	15	14	13	28	27	127
Hourly Total	55	0	59	236	94	161	389	16	57	129	73	80	62	92	142	604
07/28/2023	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11:00 AM	29	0	21	62	16	59	99	10	9	72	19	19	7	28	26	144
11:15 AM	29	0	21	72	19	54	112	10	17	53	27	16	2	22	18	157
11:30 AM	19	0	14	51	21	63	86	23	20	48	43	19	9	32	28	157
11:45 AM	27	0	17	63	33	73	113	14	18	74	32	18	6	33	24	169
Hourly Total	104	0	73	248	89	249	410	57	64	247	121	72	24	115	96	627
12:00 PM	23	0	22	68	18	69	108	17	21	76	38	21	10	35	31	177
12:15 PM	48	0	31	73	18	70	122	22	23	70	45	20	14	77	34	201
12:30 PM	26	0	16	63	32	61	111	18	28	60	46	35	19	39	54	211
12:45 PM	39	0	20	73	24	100	117	18	28	81	46	22	14	51	36	199
Hourly Total	136	0	89	277	92	300	458	75	100	287	175	98	57	202	155	788
1:00 PM	25	0	25	67	27	83	119	14	21	67	35	29	5	53	34	188
1:15 PM	26	0	23	57	30	85	110	25	24	88	49	24	5	28	29	188
1:30 PM	35	0	18	65	20	113	103	15	29	74	44	31	3	66	34	181
1:45 PM	34	0	12	53	20	82	85	11	29	75	40	27	3	41	30	155
Hourly Total	120	0	78	242	97	363	417	65	103	304	168	111	16	188	127	712
2:00 PM	22	0	23	46	21	103	90	8	26	93	34	34	11	41	45	169
2:15 PM	20	0	16	58	26	83	100	14	35	63	49	25	6	41	31	180
2:30 PM	15	0	20	53	22	92	95	10	17	47	27	25	13	32	38	160
2:45 PM	21	0	11	63	20	68	94	11	33	62	44	22	9	23	31	169
Hourly Total	78	0	70	220	89	346	379	43	111	265	154	106	39	137	145	678
3:00 PM	10	0	28	61	19	84	108	11	43	81	54	14	7	38	21	183
3:15 PM	17	0	11	67	24	69	102	12	27	57	39	14	16	27	30	171
3:30 PM	26	0	22	53	28	87	103	18	39	66	57	26	14	39	40	200
3:45 PM	15	0	28	58	21	67	107	16	30	43	46	37	9	23	46	199
Hourly Total	68	0	89	239	92	307	420	57	139	247	196	91	46	127	137	753
4:00 PM	25	0	15	54	19	59	88	11	24	49	35	26	16	38	42	165
4:15 PM	13	0	17	44	26	69	87	17	26	39	43	21	16	42	37	167
4:30 PM	15	0	10	45	22	77	77	16	37	53	53	23	17	28	40	170
4:45 PM	13	0	13	54	20	81	87	12	32	45	44	7	18	39	25	156
Hourly Total	66	0	55	197	87	286	339	56	119	186	175	77	67	147	144	658
5:00 PM	19	0	18	61	27	63	106	8	23	55	31	23	11	37	34	171
5:15 PM	21	0	11	65	15	31	91	12	30	41	42	25	12	34	37	170
5:30 PM	30	0	18	38	17	40	73	10	37	42	47	30	10	30	40	160
5:45 PM	16	0	16	50	29	54	95	8	27	53	35	19	10	48	29	159
Hourly Total	86	0	63	214	88	188	365	38	117	191	155	97	43	149	140	660
07/29/2023	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11:00 AM	64	0	16	55	20	88	91	18	34	86	52	44	21	71	65	208
11:15 AM	42	0	20	74	17	102	111	15	39	106	54	31	13	69	44	209

11:30 AM	51	0	23	46	25	131	94	11	27	80	38	37	14	46	51	183
11:45 AM	75	0	18	60	16	105	94	19	42	109	61	22	11	58	33	188
Hourly Total	232	0	77	235	78	426	390	63	142	381	205	134	59	244	193	788
12:00 PM	36	0	16	46	26	88	88	13	31	87	44	29	14	49	43	175
12:15 PM	23	0	15	52	26	90	93	9	27	47	36	32	18	39	50	179
12:30 PM	12	0	16	56	13	75	85	14	31	63	45	25	8	30	33	163
12:45 PM	41	0	20	48	17	70	85	12	30	50	42	33	11	68	44	171
Hourly Total	112	0	67	202	82	323	351	48	119	247	167	119	51	186	170	688
1:00 PM	4	0	19	62	24	98	105	15	26	65	41	21	10	64	31	177
1:15 PM	25	0	18	58	18	73	94	11	36	127	47	33	14	45	47	188
1:30 PM	29	0	13	40	27	56	80	10	37	89	47	24	11	40	35	162
1:45 PM	48	0	11	43	13	72	67	7	25	93	32	16	9	44	25	124
Hourly Total	106	0	61	203	82	299	346	43	124	374	167	94	44	193	138	651
2:00 PM	36	0	14	60	24	120	98	10	32	117	42	18	9	40	27	167
2:15 PM	53	0	20	47	11	87	78	14	26	64	40	20	15	56	35	153
2:30 PM	35	0	10	71	14	102	95	9	34	55	43	18	11	47	29	167
2:45 PM	22	0	16	47	17	82	80	15	32	53	47	22	9	52	31	158
Hourly Total	146	0	60	225	66	391	351	48	124	289	172	78	44	195	122	645
3:00 PM	40	0	13	54	21	106	88	7	27	68	34	22	3	65	25	147
3:15 PM	22	0	15	52	20	71	87	6	24	55	30	19	2	38	21	138
3:30 PM	30	0	15	53	10	106	78	12	23	95	35	20	3	52	23	136
3:45 PM	40	0	10	49	9	100	68	12	24	69	36	29	1	55	30	134
Hourly Total	132	0	53	208	60	383	321	37	98	287	135	90	9	210	99	555
4:00 PM	30	0	12	44	19	63	75	9	19	67	28	16	5	52	21	124
4:15 PM	18	0	10	44	9	57	63	9	22	34	31	21	4	31	25	119
4:30 PM	22	0	18	45	18	83	81	10	19	55	29	21	5	56	26	136
4:45 PM	30	0	21	43	20	37	84	9	25	69	34	30	5	24	35	153
Hourly Total	100	0	61	176	66	240	303	37	85	225	122	88	19	163	107	532
5:00 PM	23	0	22	36	23	76	81	11	22	49	33	29	2	43	31	145
5:15 PM	19	0	9	41	18	81	68	5	16	57	21	24	3	32	27	116
5:30 PM	8	0	16	51	15	32	82	4	11	39	15	30	3	26	33	130
5:45 PM	35	0	23	49	18	39	90	8	19	61	27	18	3	41	21	138
Hourly Total	85	0	70	177	74	228	321	28	68	206	96	101	11	142	112	529
Grand Total	1720	0	1134	3797	1400	4669	6331	775	1705	4089	2480	1622	713	2636	2335	11146
Approach %	-	-	17.9	60.0	22.1	-	-	31.3	68.8	-	-	69.5	30.5	-	-	-
Total %	-	0.0	10.2	34.1	12.6	-	56.8	7.0	15.3	-	22.3	14.6	6.4	-	20.9	-
Lights	-	0	1118	3651	1379	-	6148	760	1686	-	2446	1561	645	-	2206	10800
% Lights	-	-	98.6	96.2	98.5	-	97.1	98.1	98.9	-	98.6	96.2	90.5	-	94.5	96.9
Mediums	-	0	14	142	21	-	177	15	19	-	34	59	68	-	127	338
% Mediums	-	-	1.2	3.7	1.5	-	2.8	1.9	1.1	-	1.4	3.6	9.5	-	5.4	3.0
Articulated Trucks	-	0	2	4	0	-	6	0	0	-	0	2	0	-	2	8
% Articulated Trucks	-	-	0.2	0.1	0.0	-	0.1	0.0	0.0	-	0.0	0.1	0.0	-	0.1	0.1
Pedestrians	1720	-	-	-	-	4669	-	-	-	4089	-	-	-	2636	-	-
% Pedestrians	100.0	-	-	-	-	100.0	-	-	-	100.0	-	-	-	100.0	-	-

Progressive AE
1811 4 Mile Rd NE

Grand Rapids, Michigan, United States 49525
(616) 361-2664

Count Name: Union St at Front St
Site Code:
Start Date: 07/27/2023

Turning Movement Peak Hour Data (8:00 AM)

07/27/2023	Front St Eastbound		Front St Westbound					Union St Northbound				Union St Southbound				
	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Thru	Right	Peds	App. Total	Int. Total
8:00 AM	5	0	6	32	3	4	41	6	12	5	18	26	9	4	35	94
8:15 AM	6	0	9	44	16	8	69	3	13	6	16	10	6	9	16	101
8:30 AM	8	0	9	41	17	3	67	13	11	15	24	12	8	8	20	111
8:45 AM	9	0	7	46	12	7	65	9	11	20	20	10	12	6	22	107
Total	28	0	31	163	48	22	242	31	47	46	78	58	35	27	93	413
Approach %	-	-	12.8	67.4	19.8	-	-	39.7	60.3	-	-	62.4	37.6	-	-	-
Total %	-	0.0	7.5	39.5	11.6	-	58.6	7.5	11.4	-	18.9	14.0	8.5	-	22.5	-
PHF	-	0.000	0.861	0.886	0.706	-	0.877	0.596	0.904	-	0.813	0.558	0.729	-	0.664	0.930
Lights	-	0	29	149	47	-	225	29	41	-	70	54	30	-	84	379
% Lights	-	-	93.5	91.4	97.9	-	93.0	93.5	87.2	-	89.7	93.1	85.7	-	90.3	91.8
Mediums	-	0	0	13	1	-	14	2	6	-	8	4	5	-	9	31
% Mediums	-	-	0.0	8.0	2.1	-	5.8	6.5	12.8	-	10.3	6.9	14.3	-	9.7	7.5
Articulated Trucks	-	0	2	1	0	-	3	0	0	-	0	0	0	-	0	3
% Articulated Trucks	-	-	6.5	0.6	0.0	-	1.2	0.0	0.0	-	0.0	0.0	0.0	-	0.0	0.7
Pedestrians	28	-	-	-	-	22	-	-	-	46	-	-	-	27	-	-
% Pedestrians	100.0	-	-	-	-	100.0	-	-	-	100.0	-	-	-	100.0	-	-

Progressive AE
1811 4 Mile Rd NE

Grand Rapids, Michigan, United States 49525
(616) 361-2664

Count Name: Union St at Front St
Site Code:
Start Date: 07/27/2023

Turning Movement Peak Hour Data (4:30 PM)

07/27/2023	Front St Eastbound		Front St Westbound					Union St Northbound				Union St Southbound				
	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Thru	Right	Peds	App. Total	Int. Total
4:30 PM	12	0	21	49	19	37	89	6	21	14	27	24	17	16	41	157
4:45 PM	21	0	19	46	28	26	93	8	15	38	23	19	11	20	30	146
5:00 PM	10	0	16	69	29	38	114	4	19	27	23	13	23	19	36	173
5:15 PM	9	0	15	63	23	44	101	2	19	34	21	29	14	17	43	165
Total	52	0	71	227	99	145	397	20	74	113	94	85	65	72	150	641
Approach %	-	-	17.9	57.2	24.9	-	-	21.3	78.7	-	-	56.7	43.3	-	-	-
Total %	-	0.0	11.1	35.4	15.4	-	61.9	3.1	11.5	-	14.7	13.3	10.1	-	23.4	-
PHF	-	0.000	0.845	0.822	0.853	-	0.871	0.625	0.881	-	0.870	0.733	0.707	-	0.872	0.926
Lights	-	0	70	218	97	-	385	18	73	-	91	80	60	-	140	616
% Lights	-	-	98.6	96.0	98.0	-	97.0	90.0	98.6	-	96.8	94.1	92.3	-	93.3	96.1
Mediums	-	0	1	9	2	-	12	2	1	-	3	5	5	-	10	25
% Mediums	-	-	1.4	4.0	2.0	-	3.0	10.0	1.4	-	3.2	5.9	7.7	-	6.7	3.9
Articulated Trucks	-	0	0	0	0	-	0	0	0	-	0	0	0	-	0	0
% Articulated Trucks	-	-	0.0	0.0	0.0	-	0.0	0.0	0.0	-	0.0	0.0	0.0	-	0.0	0.0
Pedestrians	52	-	-	-	-	145	-	-	-	113	-	-	-	72	-	-
% Pedestrians	100.0	-	-	-	-	100.0	-	-	-	100.0	-	-	-	100.0	-	-

Progressive AE
1811 4 Mile Rd NE

Grand Rapids, Michigan, United States 49525
(616) 361-2664

Count Name: Union St at Front St
Site Code:
Start Date: 07/27/2023

Turning Movement Peak Hour Data (12:15 PM)

07/28/2023	Front St Eastbound		Front St Westbound					Union St Northbound				Union St Southbound				
	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Thru	Right	Peds	App. Total	Int. Total
12:15 PM	48	0	31	73	18	70	122	22	23	70	45	20	14	77	34	201
12:30 PM	26	0	16	63	32	61	111	18	28	60	46	35	19	39	54	211
12:45 PM	39	0	20	73	24	100	117	18	28	81	46	22	14	51	36	199
1:00 PM	25	0	25	67	27	83	119	14	21	67	35	29	5	53	34	188
Total	138	0	92	276	101	314	469	72	100	278	172	106	52	220	158	799
Approach %	-	-	19.6	58.8	21.5	-	-	41.9	58.1	-	-	67.1	32.9	-	-	-
Total %	-	0.0	11.5	34.5	12.6	-	58.7	9.0	12.5	-	21.5	13.3	6.5	-	19.8	-
PHF	-	0.000	0.742	0.945	0.789	-	0.961	0.818	0.893	-	0.935	0.757	0.684	-	0.731	0.947
Lights	-	0	92	263	99	-	454	69	98	-	167	100	50	-	150	771
% Lights	-	-	100.0	95.3	98.0	-	96.8	95.8	98.0	-	97.1	94.3	96.2	-	94.9	96.5
Mediums	-	0	0	11	2	-	13	3	2	-	5	6	2	-	8	26
% Mediums	-	-	0.0	4.0	2.0	-	2.8	4.2	2.0	-	2.9	5.7	3.8	-	5.1	3.3
Articulated Trucks	-	0	0	2	0	-	2	0	0	-	0	0	0	-	0	2
% Articulated Trucks	-	-	0.0	0.7	0.0	-	0.4	0.0	0.0	-	0.0	0.0	0.0	-	0.0	0.3
Pedestrians	138	-	-	-	-	314	-	-	-	278	-	-	-	220	-	-
% Pedestrians	100.0	-	-	-	-	100.0	-	-	-	100.0	-	-	-	100.0	-	-

Progressive AE
1811 4 Mile Rd NE

Grand Rapids, Michigan, United States 49525
(616) 361-2664

Count Name: Union St at Front St
Site Code:
Start Date: 07/27/2023

Turning Movement Peak Hour Data (11:00 AM)

07/29/2023	Front St Eastbound		Front St Westbound					Union St Northbound				Union St Southbound				
	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Thru	Right	Peds	App. Total	Int. Total
11:00 AM	64	0	16	55	20	88	91	18	34	86	52	44	21	71	65	208
11:15 AM	42	0	20	74	17	102	111	15	39	106	54	31	13	69	44	209
11:30 AM	51	0	23	46	25	131	94	11	27	80	38	37	14	46	51	183
11:45 AM	75	0	18	60	16	105	94	19	42	109	61	22	11	58	33	188
Total	232	0	77	235	78	426	390	63	142	381	205	134	59	244	193	788
Approach %	-	-	19.7	60.3	20.0	-	-	30.7	69.3	-	-	69.4	30.6	-	-	-
Total %	-	0.0	9.8	29.8	9.9	-	49.5	8.0	18.0	-	26.0	17.0	7.5	-	24.5	-
PHF	-	0.000	0.837	0.794	0.780	-	0.878	0.829	0.845	-	0.840	0.761	0.702	-	0.742	0.943
Lights	-	0	75	230	78	-	383	63	141	-	204	131	56	-	187	774
% Lights	-	-	97.4	97.9	100.0	-	98.2	100.0	99.3	-	99.5	97.8	94.9	-	96.9	98.2
Mediums	-	0	2	5	0	-	7	0	1	-	1	2	3	-	5	13
% Mediums	-	-	2.6	2.1	0.0	-	1.8	0.0	0.7	-	0.5	1.5	5.1	-	2.6	1.6
Articulated Trucks	-	0	0	0	0	-	0	0	0	-	0	1	0	-	1	1
% Articulated Trucks	-	-	0.0	0.0	0.0	-	0.0	0.0	0.0	-	0.0	0.7	0.0	-	0.5	0.1
Pedestrians	232	-	-	-	-	426	-	-	-	381	-	-	-	244	-	-
% Pedestrians	100.0	-	-	-	-	100.0	-	-	-	100.0	-	-	-	100.0	-	-

Progressive AE
1811 4 Mile Rd NE

Grand Rapids, Michigan, United States 49525
(616) 361-2664

Count Name: Union St at State St
Site Code:
Start Date: 07/20/2021

Turning Movement Data

Start Time	State St Eastbound					State St Westbound					Union St Northbound					Union St Southbound					
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
7:00 AM	2	20	12	1	34	0	0	0	5	0	0	28	5	0	33	3	19	0	1	22	89
7:15 AM	1	24	11	2	36	0	0	0	3	0	0	33	9	0	42	3	24	0	0	27	105
7:30 AM	4	27	18	3	49	0	0	0	5	0	0	48	15	2	63	10	32	0	0	42	154
7:45 AM	4	50	22	0	76	0	0	0	22	0	0	58	26	1	84	15	42	0	0	57	217
Hourly Total	11	121	63	6	195	0	0	0	35	0	0	167	55	3	222	31	117	0	1	148	565
8:00 AM	7	55	16	2	78	0	0	0	8	0	0	48	21	0	69	9	39	0	3	48	195
8:15 AM	7	39	21	2	67	0	0	0	6	0	0	59	9	1	68	5	33	0	1	38	173
8:30 AM	6	48	16	9	70	0	0	0	3	0	0	57	14	3	71	15	45	0	3	60	201
8:45 AM	15	66	19	3	100	0	0	0	15	0	0	76	24	1	100	15	44	0	6	59	259
Hourly Total	35	208	72	16	315	0	0	0	32	0	0	240	68	5	308	44	161	0	13	205	828
9:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1
4:00 PM	21	77	37	12	135	0	0	0	21	0	0	84	22	4	106	14	60	0	32	74	315
4:15 PM	15	97	37	22	149	0	0	0	41	0	0	92	25	19	117	23	55	0	35	78	344
4:30 PM	13	89	27	12	129	0	0	0	48	0	0	82	42	7	124	25	65	0	27	90	343
4:45 PM	8	89	28	11	125	0	0	0	30	0	0	82	38	13	120	26	56	0	10	82	327
Hourly Total	57	352	129	57	538	0	0	0	140	0	0	340	127	43	467	88	236	0	104	324	1329
5:00 PM	13	92	35	23	140	0	0	0	36	0	0	105	26	12	131	16	70	0	30	86	357
5:15 PM	15	82	28	11	125	0	0	0	29	0	0	94	26	5	120	17	57	0	26	74	319
5:30 PM	8	89	26	15	123	0	0	1	27	1	0	90	32	9	122	25	52	1	14	78	324
5:45 PM	9	73	38	6	120	0	0	0	47	0	0	78	25	5	103	13	45	0	24	58	281
Hourly Total	45	336	127	55	508	0	0	1	139	1	0	367	109	31	476	71	224	1	94	296	1281
6:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1
Grand Total	148	1017	391	134	1556	0	0	1	346	1	0	1114	359	82	1473	236	738	1	212	975	4005
Approach %	9.5	65.4	25.1	-	-	0.0	0.0	100.0	-	-	0.0	75.6	24.4	-	-	24.2	75.7	0.1	-	-	-
Total %	3.7	25.4	9.8	-	38.9	0.0	0.0	0.0	-	0.0	0.0	27.8	9.0	-	36.8	5.9	18.4	0.0	-	24.3	-
Lights	145	989	382	-	1516	0	0	1	-	1	0	1076	355	-	1431	233	719	1	-	953	3901
% Lights	98.0	97.2	97.7	-	97.4	-	-	100.0	-	100.0	-	96.6	98.9	-	97.1	98.7	97.4	100.0	-	97.7	97.4
Mediums	3	27	8	-	38	0	0	0	-	0	0	36	4	-	40	2	18	0	-	20	98
% Mediums	2.0	2.7	2.0	-	2.4	-	-	0.0	-	0.0	-	3.2	1.1	-	2.7	0.8	2.4	0.0	-	2.1	2.4
Articulated Trucks	0	1	1	-	2	0	0	0	-	0	0	2	0	-	2	1	1	0	-	2	6
% Articulated Trucks	0.0	0.1	0.3	-	0.1	-	-	0.0	-	0.0	-	0.2	0.0	-	0.1	0.4	0.1	0.0	-	0.2	0.1
Pedestrians	-	-	-	134	-	-	-	-	346	-	-	-	-	82	-	-	-	-	212	-	-
% Pedestrians	-	-	-	100.0	-	-	-	-	100.0	-	-	-	-	100.0	-	-	-	-	100.0	-	-

Progressive AE
1811 4 Mile Rd NE

Grand Rapids, Michigan, United States 49525
(616) 361-2664

Count Name: Union St at State St
Site Code:
Start Date: 07/20/2021

Turning Movement Peak Hour Data (8:00 AM)

Start Time	State St Eastbound					State St Westbound					Union St Northbound					Union St Southbound					
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
8:00 AM	7	55	16	2	78	0	0	0	8	0	0	48	21	0	69	9	39	0	3	48	195
8:15 AM	7	39	21	2	67	0	0	0	6	0	0	59	9	1	68	5	33	0	1	38	173
8:30 AM	6	48	16	9	70	0	0	0	3	0	0	57	14	3	71	15	45	0	3	60	201
8:45 AM	15	66	19	3	100	0	0	0	15	0	0	76	24	1	100	15	44	0	6	59	259
Total	35	208	72	16	315	0	0	0	32	0	0	240	68	5	308	44	161	0	13	205	828
Approach %	11.1	66.0	22.9	-	-	0.0	0.0	0.0	-	-	0.0	77.9	22.1	-	-	21.5	78.5	0.0	-	-	-
Total %	4.2	25.1	8.7	-	38.0	0.0	0.0	0.0	-	0.0	0.0	29.0	8.2	-	37.2	5.3	19.4	0.0	-	24.8	-
PHF	0.583	0.788	0.857	-	0.788	0.000	0.000	0.000	-	0.000	0.000	0.789	0.708	-	0.770	0.733	0.894	0.000	-	0.854	0.799
Lights	34	198	70	-	302	0	0	0	-	0	0	231	67	-	298	43	156	0	-	199	799
% Lights	97.1	95.2	97.2	-	95.9	-	-	-	-	-	-	96.3	98.5	-	96.8	97.7	96.9	-	-	97.1	96.5
Mediums	1	9	2	-	12	0	0	0	-	0	0	8	1	-	9	0	5	0	-	5	26
% Mediums	2.9	4.3	2.8	-	3.8	-	-	-	-	-	-	3.3	1.5	-	2.9	0.0	3.1	-	-	2.4	3.1
Articulated Trucks	0	1	0	-	1	0	0	0	-	0	0	1	0	-	1	1	0	0	-	1	3
% Articulated Trucks	0.0	0.5	0.0	-	0.3	-	-	-	-	-	-	0.4	0.0	-	0.3	2.3	0.0	-	-	0.5	0.4
Pedestrians	-	-	-	16	-	-	-	-	32	-	-	-	-	5	-	-	-	-	13	-	-
% Pedestrians	-	-	-	100.0	-	-	-	-	100.0	-	-	-	-	100.0	-	-	-	-	100.0	-	-

Progressive AE
1811 4 Mile Rd NE

Grand Rapids, Michigan, United States 49525
(616) 361-2664

Count Name: Union St at State St
Site Code:
Start Date: 07/20/2021

Turning Movement Peak Hour Data (4:15 PM)

Start Time	State St Eastbound					State St Westbound					Union St Northbound					Union St Southbound					
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
4:15 PM	15	97	37	22	149	0	0	0	41	0	0	92	25	19	117	23	55	0	35	78	344
4:30 PM	13	89	27	12	129	0	0	0	48	0	0	82	42	7	124	25	65	0	27	90	343
4:45 PM	8	89	28	11	125	0	0	0	30	0	0	82	38	13	120	26	56	0	10	82	327
5:00 PM	13	92	35	23	140	0	0	0	36	0	0	105	26	12	131	16	70	0	30	86	357
Total	49	367	127	68	543	0	0	0	155	0	0	361	131	51	492	90	246	0	102	336	1371
Approach %	9.0	67.6	23.4	-	-	0.0	0.0	0.0	-	-	0.0	73.4	26.6	-	-	26.8	73.2	0.0	-	-	-
Total %	3.6	26.8	9.3	-	39.6	0.0	0.0	0.0	-	0.0	0.0	26.3	9.6	-	35.9	6.6	17.9	0.0	-	24.5	-
PHF	0.817	0.946	0.858	-	0.911	0.000	0.000	0.000	-	0.000	0.000	0.860	0.780	-	0.939	0.865	0.879	0.000	-	0.933	0.960
Lights	49	363	125	-	537	0	0	0	-	0	0	354	130	-	484	89	240	0	-	329	1350
% Lights	100.0	98.9	98.4	-	98.9	-	-	-	-	-	-	98.1	99.2	-	98.4	98.9	97.6	-	-	97.9	98.5
Mediums	0	4	2	-	6	0	0	0	-	0	0	7	1	-	8	1	6	0	-	7	21
% Mediums	0.0	1.1	1.6	-	1.1	-	-	-	-	-	-	1.9	0.8	-	1.6	1.1	2.4	-	-	2.1	1.5
Articulated Trucks	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Articulated Trucks	0.0	0.0	0.0	-	0.0	-	-	-	-	-	-	0.0	0.0	-	0.0	0.0	0.0	-	-	0.0	0.0
Pedestrians	-	-	-	68	-	-	-	-	155	-	-	-	-	51	-	-	-	-	102	-	-
% Pedestrians	-	-	-	100.0	-	-	-	-	100.0	-	-	-	-	100.0	-	-	-	-	100.0	-	-

Progressive AE
1811 4 Mile Rd NE

Grand Rapids, Michigan, United States 49525
(616) 361-2664

Count Name: Union St at State St
Site Code:
Start Date: 03/02/2023

Turning Movement Data

03/02/2023	State St Eastbound					State St Westbound					Union St Northbound					Union St Southbound					
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
7:00 AM	0	27	0	0	27	1	5	4	1	10	1	0	0	0	1	16	0	2	1	18	56
7:15 AM	2	35	3	2	40	1	7	5	0	13	0	1	0	2	1	20	2	0	0	22	76
7:30 AM	3	56	2	0	61	4	13	3	1	20	2	1	2	2	5	33	5	2	0	40	126
7:45 AM	1	53	1	0	55	2	8	7	0	17	0	3	0	0	3	24	2	1	0	27	102
Hourly Total	6	171	6	2	183	8	33	19	2	60	3	5	2	4	10	93	9	5	1	107	360
8:00 AM	4	60	6	0	70	1	11	10	1	22	0	1	2	0	3	15	0	3	2	18	113
8:15 AM	8	39	2	1	49	2	7	12	0	21	0	1	5	1	6	17	3	2	1	22	98
8:30 AM	6	45	3	2	54	4	10	5	1	19	0	1	3	2	4	31	3	0	0	34	111
8:45 AM	3	51	2	2	56	0	18	5	0	23	0	0	3	2	3	31	2	2	2	35	117
Hourly Total	21	195	13	5	229	7	46	32	2	85	0	3	13	5	16	94	8	7	5	109	439
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4:00 PM	12	83	7	2	102	4	21	16	4	41	2	4	1	4	7	26	3	4	2	33	183
4:15 PM	8	64	4	3	76	5	23	7	0	35	6	2	2	1	10	32	7	1	4	40	161
4:30 PM	14	85	5	7	104	3	21	14	2	38	2	2	4	6	8	34	1	1	4	36	186
4:45 PM	14	65	5	3	84	2	24	7	7	33	2	1	1	5	4	35	6	2	4	43	164
Hourly Total	48	297	21	15	366	14	89	44	13	147	12	9	8	16	29	127	17	8	14	152	694
5:00 PM	14	90	3	2	107	5	23	17	8	45	0	0	1	1	1	41	0	5	3	46	199
5:15 PM	13	63	6	3	82	1	17	13	2	31	1	5	1	2	7	34	3	3	6	40	160
5:30 PM	7	63	1	1	71	2	17	13	3	32	0	2	1	1	3	40	2	4	7	46	152
5:45 PM	4	68	6	3	78	0	24	12	3	36	2	1	0	1	3	34	2	3	9	39	156
Hourly Total	38	284	16	9	338	8	81	55	16	144	3	8	3	5	14	149	7	15	25	171	667
03/03/2023	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11:00 AM	9	68	6	2	83	5	16	15	2	36	0	2	5	1	7	35	3	2	1	40	166
11:15 AM	12	78	2	1	92	0	12	11	5	23	0	1	2	2	3	25	2	1	1	28	146
11:30 AM	13	75	4	6	92	2	12	13	2	27	0	2	3	2	5	36	5	5	6	46	170
11:45 AM	16	87	5	10	108	2	18	13	4	33	0	2	6	8	8	40	3	4	6	47	196
Hourly Total	50	308	17	19	375	9	58	52	13	119	0	7	16	13	23	136	13	12	14	161	678
12:00 PM	14	72	4	8	90	4	19	12	2	35	0	1	5	2	6	46	4	4	5	54	185
12:15 PM	9	94	7	9	110	4	19	15	6	38	0	3	7	4	10	37	2	6	6	45	203
12:30 PM	8	86	6	7	100	3	22	13	7	38	2	0	2	6	4	39	4	4	6	47	189
12:45 PM	7	87	6	5	100	3	19	14	4	36	2	5	3	2	10	26	6	2	9	34	180
Hourly Total	38	339	23	29	400	14	79	54	19	147	4	9	17	14	30	148	16	16	26	180	757
1:00 PM	9	70	4	1	83	3	27	8	0	38	1	0	0	3	1	29	1	3	3	33	155
1:15 PM	10	79	13	1	102	3	16	10	10	29	3	3	4	2	10	35	3	0	6	38	179
1:30 PM	3	70	6	8	79	2	22	9	5	33	4	1	4	5	9	43	4	2	4	49	170
1:45 PM	8	71	6	4	85	2	23	10	4	35	2	2	3	4	7	28	5	3	8	36	163
Hourly Total	30	290	29	14	349	10	88	37	19	135	10	6	11	14	27	135	13	8	21	156	667
2:00 PM	12	85	6	4	103	5	18	11	6	34	3	3	8	8	14	30	2	5	10	37	188
2:15 PM	11	64	7	2	82	3	20	13	6	36	0	6	3	9	9	32	5	2	5	39	166
2:30 PM	15	75	12	4	102	2	15	11	5	28	3	2	7	6	12	34	2	5	6	41	183
2:45 PM	7	87	6	8	100	1	25	8	3	34	2	2	3	0	7	29	5	3	13	37	178
Hourly Total	45	311	31	18	387	11	78	43	20	132	8	13	21	23	42	125	14	15	34	154	715
3:00 PM	6	80	3	4	89	0	15	8	0	23	1	2	2	1	5	27	2	0	2	29	146
3:15 PM	8	81	7	6	96	4	22	14	1	40	1	2	4	6	7	28	2	3	3	33	176
3:30 PM	10	87	7	5	104	2	22	18	1	42	4	3	4	3	11	23	4	5	8	32	189
3:45 PM	9	93	7	2	109	1	28	20	11	49	3	5	1	5	9	33	1	5	8	39	206
Hourly Total	33	341	24	17	398	7	87	60	13	154	9	12	11	15	32	111	9	13	21	133	717
4:00 PM	12	81	2	4	95	4	32	9	2	45	2	1	1	4	4	43	3	3	6	49	193
4:15 PM	5	83	3	5	91	3	25	9	1	37	1	2	0	3	3	31	1	0	2	32	163
4:30 PM	14	78	5	3	97	0	16	12	6	28	3	1	6	4	10	38	6	4	5	48	183
4:45 PM	9	76	8	1	93	1	29	14	6	44	2	1	6	3	9	49	2	6	8	57	203
Hourly Total	40	318	18	13	376	8	102	44	15	154	8	5	13	14	26	161	12	13	21	186	742
5:00 PM	17	71	4	6	92	5	36	9	10	50	3	2	3	5	8	52	2	2	19	56	206
5:15 PM	14	86	1	7	101	3	28	16	8	47	1	0	3	7	4	43	1	7	4	51	203
5:30 PM	10	66	8	4	84	3	22	18	4	43	0	1	2	3	3	38	0	6	9	44	174
5:45 PM	6	63	6	5	75	2	25	12	8	39	0	2	2	6	4	35	2	7	11	44	162
Hourly Total	47	286	19	22	352	13	111	55	30	179	4	5	10	21	19	168	5	22	43	195	745
03/04/2023	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11:00 AM	7	54	7	5	68	3	20	7	1	30	4	6	4	2	14	34	3	7	15	44	156
11:15 AM	12	56	6	3	74	5	15	6	5	26	0	5	2	6	7	29	1	1	7	31	138

11:30 AM	10	56	7	2	73	0	12	13	7	25	0	3	1	5	4	19	3	5	3	27	129
11:45 AM	4	55	6	3	65	1	19	10	6	30	0	1	3	5	4	33	1	7	4	41	140
Hourly Total	33	221	26	13	280	9	66	36	19	111	4	15	10	18	29	115	8	20	29	143	563
12:00 PM	11	47	6	10	64	1	22	0	0	23	0	1	3	8	4	26	2	3	6	31	122
12:15 PM	13	69	5	1	87	3	28	15	3	46	2	1	2	9	5	41	2	6	16	49	187
12:30 PM	8	79	8	8	95	3	9	5	2	17	2	1	4	5	7	34	5	4	16	43	162
12:45 PM	11	53	10	15	74	5	22	9	7	36	0	5	5	10	10	28	4	2	11	34	154
Hourly Total	43	248	29	34	320	12	81	29	12	122	4	8	14	32	26	129	13	15	49	157	625
1:00 PM	14	65	5	3	84	4	16	29	7	49	4	1	5	8	10	32	4	5	16	41	184
1:15 PM	12	59	3	11	74	5	19	13	6	37	1	3	3	5	7	36	5	6	13	47	165
1:30 PM	10	66	4	5	80	3	11	6	3	20	1	2	2	2	5	32	3	3	21	38	143
1:45 PM	7	64	9	8	80	1	16	5	10	22	4	2	2	14	8	44	2	5	5	51	161
Hourly Total	43	254	21	27	318	13	62	53	26	128	10	8	12	29	30	144	14	19	55	177	653
2:00 PM	7	68	5	7	80	3	17	10	4	30	0	4	0	5	4	31	1	4	16	36	150
2:15 PM	13	76	3	3	92	3	15	15	9	33	1	2	2	0	5	31	3	6	10	40	170
2:30 PM	5	67	9	3	81	2	16	16	14	34	0	3	4	4	7	40	1	0	17	41	163
2:45 PM	4	62	2	4	68	2	14	4	2	20	1	1	1	5	3	41	0	1	14	42	133
Hourly Total	29	273	19	17	321	10	62	45	29	117	2	10	7	14	19	143	5	11	57	159	616
3:00 PM	8	60	2	1	70	2	20	9	4	31	0	1	2	2	3	36	0	7	14	43	147
3:15 PM	9	44	2	4	55	1	12	11	8	24	0	2	0	4	2	29	0	6	10	35	116
3:30 PM	8	38	5	5	51	1	9	15	8	25	2	1	3	2	6	32	2	0	19	34	116
3:45 PM	13	55	1	7	69	4	17	13	2	34	2	0	0	0	2	41	1	2	20	44	149
Hourly Total	38	197	10	17	245	8	58	48	22	114	4	4	5	8	13	138	3	15	63	156	528
4:00 PM	15	62	1	5	78	2	14	13	4	29	2	0	1	3	3	29	1	3	7	33	143
4:15 PM	6	69	3	4	78	2	15	8	9	25	2	3	0	2	5	34	1	5	13	40	148
4:30 PM	8	56	2	2	66	1	14	9	3	24	0	2	2	2	4	38	3	4	8	45	139
4:45 PM	8	62	0	4	70	0	22	14	6	36	1	0	0	5	1	40	2	2	17	44	151
Hourly Total	37	249	6	15	292	5	65	44	22	114	5	5	3	12	13	141	7	14	45	162	581
5:00 PM	10	64	1	2	75	1	29	5	2	35	0	1	1	3	2	45	0	6	12	51	163
5:15 PM	6	52	3	2	61	0	13	8	6	21	0	0	0	1	0	33	1	6	27	40	122
5:30 PM	6	48	1	6	55	0	12	8	14	20	0	1	0	9	1	36	0	3	20	39	115
5:45 PM	11	51	5	3	67	1	19	8	15	28	2	0	2	6	4	32	2	13	25	47	146
Hourly Total	33	215	10	13	258	2	73	29	37	104	2	2	3	19	7	146	3	28	84	177	546
Grand Total	652	4797	338	299	5787	168	1319	779	329	2266	92	134	179	276	405	2403	176	256	607	2835	11293
Approach %	11.3	82.9	5.8	-	-	7.4	58.2	34.4	-	-	22.7	33.1	44.2	-	-	84.8	6.2	9.0	-	-	-
Total %	5.8	42.5	3.0	-	51.2	1.5	11.7	6.9	-	20.1	0.8	1.2	1.6	-	3.6	21.3	1.6	2.3	-	25.1	-
Lights	639	4673	334	-	5646	168	1293	761	-	2222	92	134	179	-	405	2338	175	256	-	2769	11042
% Lights	98.0	97.4	98.8	-	97.6	100.0	98.0	97.7	-	98.1	100.0	100.0	100.0	-	100.0	97.3	99.4	100.0	-	97.7	97.8
Mediums	13	123	4	-	140	0	26	16	-	42	0	0	0	-	0	64	1	0	-	65	247
% Mediums	2.0	2.6	1.2	-	2.4	0.0	2.0	2.1	-	1.9	0.0	0.0	0.0	-	0.0	2.7	0.6	0.0	-	2.3	2.2
Articulated Trucks	0	1	0	-	1	0	0	2	-	2	0	0	0	-	0	1	0	0	-	1	4
% Articulated Trucks	0.0	0.0	0.0	-	0.0	0.0	0.0	0.3	-	0.1	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0
Pedestrians	-	-	-	299	-	-	-	-	329	-	-	-	-	276	-	-	-	-	607	-	-
% Pedestrians	-	-	-	100.0	-	-	-	-	100.0	-	-	-	-	100.0	-	-	-	-	100.0	-	-

Progressive AE
1811 4 Mile Rd NE

Grand Rapids, Michigan, United States 49525
(616) 361-2664

Count Name: Union St at State St
Site Code:
Start Date: 03/02/2023

Turning Movement Peak Hour Data (7:30 AM)

03/02/2023	State St Eastbound					State St Westbound					Union St Northbound					Union St Southbound					
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
7:30 AM	3	56	2	0	61	4	13	3	1	20	2	1	2	2	5	33	5	2	0	40	126
7:45 AM	1	53	1	0	55	2	8	7	0	17	0	3	0	0	3	24	2	1	0	27	102
8:00 AM	4	60	6	0	70	1	11	10	1	22	0	1	2	0	3	15	0	3	2	18	113
8:15 AM	8	39	2	1	49	2	7	12	0	21	0	1	5	1	6	17	3	2	1	22	98
Total	16	208	11	1	235	9	39	32	2	80	2	6	9	3	17	89	10	8	3	107	439
Approach %	6.8	88.5	4.7	-	-	11.3	48.8	40.0	-	-	11.8	35.3	52.9	-	-	83.2	9.3	7.5	-	-	-
Total %	3.6	47.4	2.5	-	53.5	2.1	8.9	7.3	-	18.2	0.5	1.4	2.1	-	3.9	20.3	2.3	1.8	-	24.4	-
PHF	0.500	0.867	0.458	-	0.839	0.563	0.750	0.667	-	0.909	0.250	0.500	0.450	-	0.708	0.674	0.500	0.667	-	0.669	0.871
Lights	15	195	11	-	221	9	34	31	-	74	2	6	9	-	17	85	10	8	-	103	415
% Lights	93.8	93.8	100.0	-	94.0	100.0	87.2	96.9	-	92.5	100.0	100.0	100.0	-	100.0	95.5	100.0	100.0	-	96.3	94.5
Mediums	1	12	0	-	13	0	5	1	-	6	0	0	0	-	0	4	0	0	-	4	23
% Mediums	6.3	5.8	0.0	-	5.5	0.0	12.8	3.1	-	7.5	0.0	0.0	0.0	-	0.0	4.5	0.0	0.0	-	3.7	5.2
Articulated Trucks	0	1	0	-	1	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	1
% Articulated Trucks	0.0	0.5	0.0	-	0.4	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.2
Pedestrians	-	-	-	1	-	-	-	-	2	-	-	-	-	3	-	-	-	-	3	-	-
% Pedestrians	-	-	-	100.0	-	-	-	-	100.0	-	-	-	-	100.0	-	-	-	-	100.0	-	-

Turning Movement Peak Hour Data (4:15 PM)

03/02/2023	State St Eastbound					State St Westbound					Union St Northbound					Union St Southbound					
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
4:15 PM	8	64	4	3	76	5	23	7	0	35	6	2	2	1	10	32	7	1	4	40	161
4:30 PM	14	85	5	7	104	3	21	14	2	38	2	2	4	6	8	34	1	1	4	36	186
4:45 PM	14	65	5	3	84	2	24	7	7	33	2	1	1	5	4	35	6	2	4	43	164
5:00 PM	14	90	3	2	107	5	23	17	8	45	0	0	1	1	1	41	0	5	3	46	199
Total	50	304	17	15	371	15	91	45	17	151	10	5	8	13	23	142	14	9	15	165	710
Approach %	13.5	81.9	4.6	-	-	9.9	60.3	29.8	-	-	43.5	21.7	34.8	-	-	86.1	8.5	5.5	-	-	-
Total %	7.0	42.8	2.4	-	52.3	2.1	12.8	6.3	-	21.3	1.4	0.7	1.1	-	3.2	20.0	2.0	1.3	-	23.2	-
PHF	0.893	0.844	0.850	-	0.867	0.750	0.948	0.662	-	0.839	0.417	0.625	0.500	-	0.575	0.866	0.500	0.450	-	0.897	0.892
Lights	49	297	17	-	363	15	90	45	-	150	10	5	8	-	23	140	14	9	-	163	699
% Lights	98.0	97.7	100.0	-	97.8	100.0	98.9	100.0	-	99.3	100.0	100.0	100.0	-	100.0	98.6	100.0	100.0	-	98.8	98.5
Mediums	1	7	0	-	8	0	1	0	-	1	0	0	0	-	0	2	0	0	-	2	11
% Mediums	2.0	2.3	0.0	-	2.2	0.0	1.1	0.0	-	0.7	0.0	0.0	0.0	-	0.0	1.4	0.0	0.0	-	1.2	1.5
Articulated Trucks	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Articulated Trucks	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0
Pedestrians	-	-	-	15	-	-	-	-	17	-	-	-	-	13	-	-	-	-	15	-	-
% Pedestrians	-	-	-	100.0	-	-	-	-	100.0	-	-	-	-	100.0	-	-	-	-	100.0	-	-

Progressive AE
1811 4 Mile Rd NE

Grand Rapids, Michigan, United States 49525
(616) 361-2664

Count Name: Union St at State St
Site Code:
Start Date: 03/02/2023

Turning Movement Peak Hour Data (4:30 PM)

03/03/2023	State St Eastbound					State St Westbound					Union St Northbound					Union St Southbound					
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
4:30 PM	14	78	5	3	97	0	16	12	6	28	3	1	6	4	10	38	6	4	5	48	183
4:45 PM	9	76	8	1	93	1	29	14	6	44	2	1	6	3	9	49	2	6	8	57	203
5:00 PM	17	71	4	6	92	5	36	9	10	50	3	2	3	5	8	52	2	2	19	56	206
5:15 PM	14	86	1	7	101	3	28	16	8	47	1	0	3	7	4	43	1	7	4	51	203
Total	54	311	18	17	383	9	109	51	30	169	9	4	18	19	31	182	11	19	36	212	795
Approach %	14.1	81.2	4.7	-	-	5.3	64.5	30.2	-	-	29.0	12.9	58.1	-	-	85.8	5.2	9.0	-	-	-
Total %	6.8	39.1	2.3	-	48.2	1.1	13.7	6.4	-	21.3	1.1	0.5	2.3	-	3.9	22.9	1.4	2.4	-	26.7	-
PHF	0.794	0.904	0.563	-	0.948	0.450	0.757	0.797	-	0.845	0.750	0.500	0.750	-	0.775	0.875	0.458	0.679	-	0.930	0.965
Lights	54	304	18	-	376	9	108	51	-	168	9	4	18	-	31	180	11	19	-	210	785
% Lights	100.0	97.7	100.0	-	98.2	100.0	99.1	100.0	-	99.4	100.0	100.0	100.0	-	100.0	98.9	100.0	100.0	-	99.1	98.7
Mediums	0	7	0	-	7	0	1	0	-	1	0	0	0	-	0	2	0	0	-	2	10
% Mediums	0.0	2.3	0.0	-	1.8	0.0	0.9	0.0	-	0.6	0.0	0.0	0.0	-	0.0	1.1	0.0	0.0	-	0.9	1.3
Articulated Trucks	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Articulated Trucks	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0
Pedestrians	-	-	-	17	-	-	-	-	30	-	-	-	-	19	-	-	-	-	36	-	-
% Pedestrians	-	-	-	100.0	-	-	-	-	100.0	-	-	-	-	100.0	-	-	-	-	100.0	-	-

Turning Movement Peak Hour Data (12:15 PM)

03/04/2023	State St Eastbound					State St Westbound					Union St Northbound					Union St Southbound					
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
12:15 PM	13	69	5	1	87	3	28	15	3	46	2	1	2	9	5	41	2	6	16	49	187
12:30 PM	8	79	8	8	95	3	9	5	2	17	2	1	4	5	7	34	5	4	16	43	162
12:45 PM	11	53	10	15	74	5	22	9	7	36	0	5	5	10	10	28	4	2	11	34	154
1:00 PM	14	65	5	3	84	4	16	29	7	49	4	1	5	8	10	32	4	5	16	41	184
Total	46	266	28	27	340	15	75	58	19	148	8	8	16	32	32	135	15	17	59	167	687
Approach %	13.5	78.2	8.2	-	-	10.1	50.7	39.2	-	-	25.0	25.0	50.0	-	-	80.8	9.0	10.2	-	-	-
Total %	6.7	38.7	4.1	-	49.5	2.2	10.9	8.4	-	21.5	1.2	1.2	2.3	-	4.7	19.7	2.2	2.5	-	24.3	-
PHF	0.821	0.842	0.700	-	0.895	0.750	0.670	0.500	-	0.755	0.500	0.400	0.800	-	0.800	0.823	0.750	0.708	-	0.852	0.918
Lights	46	264	28	-	338	15	74	58	-	147	8	8	16	-	32	133	15	17	-	165	682
% Lights	100.0	99.2	100.0	-	99.4	100.0	98.7	100.0	-	99.3	100.0	100.0	100.0	-	100.0	98.5	100.0	100.0	-	98.8	99.3
Mediums	0	2	0	-	2	0	1	0	-	1	0	0	0	-	0	2	0	0	-	2	5
% Mediums	0.0	0.8	0.0	-	0.6	0.0	1.3	0.0	-	0.7	0.0	0.0	0.0	-	0.0	1.5	0.0	0.0	-	1.2	0.7
Articulated Trucks	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Articulated Trucks	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0
Pedestrians	-	-	-	27	-	-	-	-	19	-	-	-	-	32	-	-	-	-	59	-	-
% Pedestrians	-	-	-	100.0	-	-	-	-	100.0	-	-	-	-	100.0	-	-	-	-	100.0	-	-

Progressive AE
1811 4 Mile Rd NE

Grand Rapids, Michigan, United States 49525
(616) 361-2664

Count Name: Union St at State St
Site Code:
Start Date: 05/18/2023

Turning Movement Data

05/18/2023	State St Eastbound					State St Westbound					Union St Northbound					Union St Southbound					
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
7:00 AM	0	24	1	0	25	0	12	6	0	18	0	0	0	2	0	14	0	3	3	17	60
7:15 AM	4	35	0	1	39	0	11	3	1	14	0	0	0	0	0	23	2	3	1	28	81
7:30 AM	5	47	0	3	52	0	19	13	0	32	0	0	0	3	0	25	0	1	1	26	110
7:45 AM	3	54	0	0	57	0	17	14	1	31	0	0	0	6	0	33	0	2	0	35	123
Hourly Total	12	160	1	4	173	0	59	36	2	95	0	0	0	11	0	95	2	9	5	106	374
8:00 AM	10	60	0	0	70	0	15	12	3	27	0	1	0	1	1	25	0	1	0	26	124
8:15 AM	10	57	0	3	67	0	24	6	0	30	0	1	0	4	1	30	0	2	1	32	130
8:30 AM	7	51	0	2	58	0	18	3	1	21	0	0	0	4	0	25	0	2	1	27	106
8:45 AM	8	45	0	4	53	0	15	8	0	23	0	1	0	1	1	29	0	4	1	33	110
Hourly Total	35	213	0	9	248	0	72	29	4	101	0	3	0	10	3	109	0	9	3	118	470
05/18/2023	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4:00 PM	9	87	0	3	96	0	23	21	1	44	0	0	0	4	0	43	1	3	5	47	187
4:15 PM	14	85	0	5	99	0	20	13	7	33	0	0	0	7	0	43	0	2	5	45	177
4:30 PM	5	80	0	0	85	1	25	14	3	40	0	1	1	1	2	52	0	3	5	55	182
4:45 PM	10	78	0	1	88	0	33	10	4	43	0	0	0	3	0	49	1	2	8	52	183
Hourly Total	38	330	0	9	368	1	101	58	15	160	0	1	1	15	2	187	2	10	23	199	729
5:00 PM	7	89	0	6	96	0	37	24	4	61	0	0	0	8	0	58	0	9	5	67	224
5:15 PM	5	77	0	3	82	0	18	15	6	33	0	0	0	6	0	50	0	0	7	50	165
5:30 PM	7	81	0	7	88	0	27	14	8	41	0	0	0	14	0	39	0	2	3	41	170
5:45 PM	9	60	0	3	69	1	24	15	6	40	0	0	0	2	0	23	3	4	9	30	139
Hourly Total	28	307	0	19	335	1	106	68	24	175	0	0	0	30	0	170	3	15	24	188	698
05/19/2023	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11:00 AM	9	83	0	7	92	0	29	7	3	36	0	0	0	0	0	41	0	0	5	41	169
11:15 AM	16	82	0	6	98	0	24	10	9	34	0	0	0	5	0	41	0	7	7	48	180
11:30 AM	13	84	0	5	97	0	24	18	7	42	0	0	0	3	0	50	0	4	6	54	193
11:45 AM	17	79	0	8	96	1	29	12	8	42	0	0	0	10	0	45	0	7	10	52	190
Hourly Total	55	328	0	26	383	1	106	47	27	154	0	0	0	18	0	177	0	18	28	195	732
12:00 PM	8	87	0	7	95	0	31	21	9	52	0	0	0	1	0	36	0	10	12	46	193
12:15 PM	20	88	0	8	108	0	31	14	6	45	0	0	0	11	0	52	0	6	12	58	211
12:30 PM	12	95	0	8	107	0	38	16	7	54	0	0	0	15	0	54	0	7	11	61	222
12:45 PM	5	114	0	9	119	0	27	17	4	44	0	0	0	2	0	43	0	7	13	50	213
Hourly Total	45	384	0	32	429	0	127	68	26	195	0	0	0	29	0	185	0	30	48	215	839
1:00 PM	15	93	0	7	108	0	38	13	8	51	0	0	0	7	0	43	0	7	9	50	209
1:15 PM	16	100	0	7	116	0	29	16	16	45	0	0	0	14	0	36	0	11	11	47	208
1:30 PM	7	94	0	2	101	0	32	16	10	48	0	1	0	7	1	53	0	7	17	60	210
1:45 PM	16	77	0	7	93	1	35	24	8	60	0	0	0	9	0	49	0	4	4	53	206
Hourly Total	54	364	0	23	418	1	134	69	42	204	0	1	0	37	1	181	0	29	41	210	833
2:00 PM	15	93	0	7	108	0	23	23	5	46	0	0	0	6	0	47	0	6	4	53	207
2:15 PM	8	94	0	10	102	0	26	16	4	42	0	0	0	4	0	38	0	6	9	44	188
2:30 PM	7	78	0	13	85	0	32	13	4	45	0	0	0	6	0	41	0	4	4	45	175
2:45 PM	10	86	0	7	96	0	29	27	16	56	0	0	0	9	0	39	0	4	9	43	195
Hourly Total	40	351	0	37	391	0	110	79	29	189	0	0	0	25	0	165	0	20	26	185	765
3:00 PM	20	71	0	11	91	0	32	23	3	55	0	0	0	2	0	37	0	4	12	41	187
3:15 PM	17	94	0	3	111	0	19	13	2	32	0	0	0	4	0	41	0	4	14	45	188
3:30 PM	11	80	0	5	91	0	25	22	13	47	0	0	1	7	1	32	0	3	8	35	174
3:45 PM	19	97	0	10	116	0	27	17	10	44	0	1	0	6	1	40	0	2	7	42	203
Hourly Total	67	342	0	29	409	0	103	75	28	178	0	1	1	19	2	150	0	13	41	163	752
4:00 PM	8	77	0	11	85	0	32	16	8	48	0	0	0	13	0	32	0	4	2	36	169
4:15 PM	11	81	0	9	92	0	21	11	4	32	0	0	0	2	0	52	0	4	3	56	180
4:30 PM	5	72	0	6	77	0	24	17	3	41	0	0	0	2	0	51	0	4	10	55	173
4:45 PM	9	82	0	10	91	0	42	10	2	52	0	0	1	7	1	35	0	5	21	40	184
Hourly Total	33	312	0	36	345	0	119	54	17	173	0	0	1	24	1	170	0	17	36	187	706
5:00 PM	11	88	0	9	99	0	30	33	5	63	0	0	2	13	2	54	0	7	9	61	225
5:15 PM	8	68	0	9	76	0	23	12	4	35	0	0	0	5	0	47	0	7	23	54	165
5:30 PM	4	74	0	9	78	0	26	13	4	39	0	0	0	4	0	51	0	3	12	54	171
5:45 PM	6	62	0	12	68	0	31	10	11	41	0	0	0	12	0	41	0	4	3	45	154
Hourly Total	29	292	0	39	321	0	110	68	24	178	0	0	2	34	2	193	0	21	47	214	715
05/20/2023	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11:00 AM	6	73	0	8	79	0	21	6	4	27	0	0	0	4	0	35	0	6	5	41	147
11:15 AM	8	55	0	6	63	0	26	13	7	39	0	0	0	5	0	41	0	9	7	50	152

11:30 AM	6	58	0	3	64	0	14	13	4	27	0	0	0	2	0	45	0	5	17	50	141
11:45 AM	6	84	0	9	90	0	30	12	6	42	0	0	1	4	1	48	0	0	9	48	181
Hourly Total	26	270	0	26	296	0	91	44	21	135	0	0	1	15	1	169	0	20	38	189	621
12:00 PM	9	58	0	6	67	0	26	17	3	43	0	0	0	2	0	49	0	8	10	57	167
12:15 PM	10	67	0	5	77	0	41	8	9	49	0	0	0	8	0	56	0	3	6	59	185
12:30 PM	22	55	0	9	77	0	22	19	3	41	0	0	0	10	0	46	0	7	10	53	171
12:45 PM	9	71	0	6	80	0	26	5	2	31	0	0	0	2	0	42	0	3	7	45	156
Hourly Total	50	251	0	26	301	0	115	49	17	164	0	0	0	22	0	193	0	21	33	214	679
1:00 PM	11	73	0	10	84	0	34	15	7	49	0	0	0	12	0	39	0	8	16	47	180
1:15 PM	4	68	0	2	72	0	26	17	6	43	0	0	0	4	0	35	0	7	7	42	157
1:30 PM	8	65	0	1	73	0	27	9	21	36	0	0	0	4	0	41	0	4	13	45	154
1:45 PM	4	63	0	14	67	0	31	17	5	48	0	0	1	11	1	45	0	4	18	49	165
Hourly Total	27	269	0	27	296	0	118	58	39	176	0	0	1	31	1	160	0	23	54	183	656
2:00 PM	11	73	0	5	84	0	26	15	9	41	0	0	0	5	0	38	0	1	18	39	164
2:15 PM	14	70	0	7	84	0	25	14	11	39	0	0	0	8	0	40	0	2	9	42	165
2:30 PM	3	72	0	1	75	0	18	6	12	24	0	0	0	4	0	27	0	2	17	29	128
2:45 PM	3	55	0	6	58	0	17	7	12	24	0	0	0	5	0	42	0	4	9	46	128
Hourly Total	31	270	0	19	301	0	86	42	44	128	0	0	0	22	0	147	0	9	53	156	585
3:00 PM	10	66	0	0	76	0	22	11	17	33	1	0	0	14	1	30	0	3	9	33	143
3:15 PM	11	56	0	12	67	0	22	8	10	30	0	0	0	13	0	33	0	1	11	34	131
3:30 PM	9	54	0	7	63	0	28	18	17	46	0	0	0	16	0	40	0	10	11	50	159
3:45 PM	7	64	0	4	71	0	19	12	6	31	0	0	0	2	0	34	0	3	28	37	139
Hourly Total	37	240	0	23	277	0	91	49	50	140	1	0	0	45	1	137	0	17	59	154	572
4:00 PM	11	77	0	6	88	0	25	7	13	32	0	0	0	3	0	29	0	4	13	33	153
4:15 PM	6	60	0	5	66	0	25	6	10	31	0	0	0	4	0	28	0	3	8	31	128
4:30 PM	3	59	0	0	62	0	12	12	2	24	0	0	0	2	0	30	0	2	0	32	118
4:45 PM	5	58	0	5	63	0	10	7	7	17	0	0	0	8	0	41	0	4	6	45	125
Hourly Total	25	254	0	16	279	0	72	32	32	104	0	0	0	17	0	128	0	13	27	141	524
5:00 PM	6	64	0	1	70	0	21	7	2	28	0	0	0	0	0	44	0	0	19	44	142
5:15 PM	5	54	0	5	59	0	13	8	4	21	0	0	0	3	0	36	0	1	15	37	117
5:30 PM	5	55	0	1	60	0	13	9	15	22	1	1	0	3	2	34	0	4	10	38	122
5:45 PM	10	60	0	2	70	0	19	12	2	31	0	0	0	6	0	32	0	2	25	34	135
Hourly Total	26	233	0	9	259	0	66	36	23	102	1	1	0	12	2	146	0	7	69	153	516
Grand Total	658	5170	1	409	5829	4	1786	961	464	2751	2	7	7	416	16	2862	7	301	655	3170	11766
Approach %	11.3	88.7	0.0	-	-	0.1	64.9	34.9	-	-	12.5	43.8	43.8	-	-	90.3	0.2	9.5	-	-	-
Total %	5.6	43.9	0.0	-	49.5	0.0	15.2	8.2	-	23.4	0.0	0.1	0.1	-	0.1	24.3	0.1	2.6	-	26.9	-
Lights	644	5034	1	-	5679	4	1755	947	-	2706	2	7	7	-	16	2793	6	300	-	3099	11500
% Lights	97.9	97.4	100.0	-	97.4	100.0	98.3	98.5	-	98.4	100.0	100.0	100.0	-	100.0	97.6	85.7	99.7	-	97.8	97.7
Mediums	13	130	0	-	143	0	28	11	-	39	0	0	0	-	0	66	1	1	-	68	250
% Mediums	2.0	2.5	0.0	-	2.5	0.0	1.6	1.1	-	1.4	0.0	0.0	0.0	-	0.0	2.3	14.3	0.3	-	2.1	2.1
Articulated Trucks	1	6	0	-	7	0	3	3	-	6	0	0	0	-	0	3	0	0	-	3	16
% Articulated Trucks	0.2	0.1	0.0	-	0.1	0.0	0.2	0.3	-	0.2	0.0	0.0	0.0	-	0.0	0.1	0.0	0.0	-	0.1	0.1
Pedestrians	-	-	-	409	-	-	-	-	464	-	-	-	-	416	-	-	-	-	655	-	-
% Pedestrians	-	-	-	100.0	-	-	-	-	100.0	-	-	-	-	100.0	-	-	-	-	100.0	-	-

Progressive AE
1811 4 Mile Rd NE

Grand Rapids, Michigan, United States 49525
(616) 361-2664

Count Name: Union St at State St
Site Code:
Start Date: 05/18/2023

Turning Movement Peak Hour Data (7:30 AM)

05/18/2023	State St Eastbound					State St Westbound					Union St Northbound					Union St Southbound					
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
7:30 AM	5	47	0	3	52	0	19	13	0	32	0	0	0	3	0	25	0	1	1	26	110
7:45 AM	3	54	0	0	57	0	17	14	1	31	0	0	0	6	0	33	0	2	0	35	123
8:00 AM	10	60	0	0	70	0	15	12	3	27	0	1	0	1	1	25	0	1	0	26	124
8:15 AM	10	57	0	3	67	0	24	6	0	30	0	1	0	4	1	30	0	2	1	32	130
Total	28	218	0	6	246	0	75	45	4	120	0	2	0	14	2	113	0	6	2	119	487
Approach %	11.4	88.6	0.0	-	-	0.0	62.5	37.5	-	-	0.0	100.0	0.0	-	-	95.0	0.0	5.0	-	-	-
Total %	5.7	44.8	0.0	-	50.5	0.0	15.4	9.2	-	24.6	0.0	0.4	0.0	-	0.4	23.2	0.0	1.2	-	24.4	-
PHF	0.700	0.908	0.000	-	0.879	0.000	0.781	0.804	-	0.938	0.000	0.500	0.000	-	0.500	0.856	0.000	0.750	-	0.850	0.937
Lights	27	211	0	-	238	0	72	42	-	114	0	2	0	-	2	110	0	6	-	116	470
% Lights	96.4	96.8	-	-	96.7	-	96.0	93.3	-	95.0	-	100.0	-	-	100.0	97.3	-	100.0	-	97.5	96.5
Mediums	1	6	0	-	7	0	3	1	-	4	0	0	0	-	0	3	0	0	-	3	14
% Mediums	3.6	2.8	-	-	2.8	-	4.0	2.2	-	3.3	-	0.0	-	-	0.0	2.7	-	0.0	-	2.5	2.9
Articulated Trucks	0	1	0	-	1	0	0	2	-	2	0	0	0	-	0	0	0	0	-	0	3
% Articulated Trucks	0.0	0.5	-	-	0.4	-	0.0	4.4	-	1.7	-	0.0	-	-	0.0	0.0	-	0.0	-	0.0	0.6
Pedestrians	-	-	-	6	-	-	-	-	4	-	-	-	-	14	-	-	-	-	2	-	-
% Pedestrians	-	-	-	100.0	-	-	-	-	100.0	-	-	-	-	100.0	-	-	-	-	100.0	-	-

Turning Movement Peak Hour Data (4:15 PM)

05/18/2023	State St Eastbound					State St Westbound					Union St Northbound					Union St Southbound					
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
4:15 PM	14	85	0	5	99	0	20	13	7	33	0	0	0	7	0	43	0	2	5	45	177
4:30 PM	5	80	0	0	85	1	25	14	3	40	0	1	1	1	2	52	0	3	5	55	182
4:45 PM	10	78	0	1	88	0	33	10	4	43	0	0	0	3	0	49	1	2	8	52	183
5:00 PM	7	89	0	6	96	0	37	24	4	61	0	0	0	8	0	58	0	9	5	67	224
Total	36	332	0	12	368	1	115	61	18	177	0	1	1	19	2	202	1	16	23	219	766
Approach %	9.8	90.2	0.0	-	-	0.6	65.0	34.5	-	-	0.0	50.0	50.0	-	-	92.2	0.5	7.3	-	-	-
Total %	4.7	43.3	0.0	-	48.0	0.1	15.0	8.0	-	23.1	0.0	0.1	0.1	-	0.3	26.4	0.1	2.1	-	28.6	-
PHF	0.643	0.933	0.000	-	0.929	0.250	0.777	0.635	-	0.725	0.000	0.250	0.250	-	0.250	0.871	0.250	0.444	-	0.817	0.855
Lights	36	322	0	-	358	1	114	60	-	175	0	1	1	-	2	200	1	16	-	217	752
% Lights	100.0	97.0	-	-	97.3	100.0	99.1	98.4	-	98.9	-	100.0	100.0	-	100.0	99.0	100.0	100.0	-	99.1	98.2
Mediums	0	10	0	-	10	0	1	1	-	2	0	0	0	-	0	2	0	0	-	2	14
% Mediums	0.0	3.0	-	-	2.7	0.0	0.9	1.6	-	1.1	-	0.0	0.0	-	0.0	1.0	0.0	0.0	-	0.9	1.8
Articulated Trucks	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Articulated Trucks	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	0.0	-	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0
Pedestrians	-	-	-	12	-	-	-	-	18	-	-	-	-	19	-	-	-	-	23	-	-
% Pedestrians	-	-	-	100.0	-	-	-	-	100.0	-	-	-	-	100.0	-	-	-	-	100.0	-	-

Progressive AE
1811 4 Mile Rd NE

Grand Rapids, Michigan, United States 49525
(616) 361-2664

Count Name: Union St at State St
Site Code:
Start Date: 05/18/2023

Turning Movement Peak Hour Data (12:15 PM)

05/19/2023	State St Eastbound					State St Westbound					Union St Northbound					Union St Southbound					
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
12:15 PM	20	88	0	8	108	0	31	14	6	45	0	0	0	11	0	52	0	6	12	58	211
12:30 PM	12	95	0	8	107	0	38	16	7	54	0	0	0	15	0	54	0	7	11	61	222
12:45 PM	5	114	0	9	119	0	27	17	4	44	0	0	0	2	0	43	0	7	13	50	213
1:00 PM	15	93	0	7	108	0	38	13	8	51	0	0	0	7	0	43	0	7	9	50	209
Total	52	390	0	32	442	0	134	60	25	194	0	0	0	35	0	192	0	27	45	219	855
Approach %	11.8	88.2	0.0	-	-	0.0	69.1	30.9	-	-	0.0	0.0	0.0	-	-	87.7	0.0	12.3	-	-	-
Total %	6.1	45.6	0.0	-	51.7	0.0	15.7	7.0	-	22.7	0.0	0.0	0.0	-	0.0	22.5	0.0	3.2	-	25.6	-
PHF	0.650	0.855	0.000	-	0.929	0.000	0.882	0.882	-	0.898	0.000	0.000	0.000	-	0.000	0.889	0.000	0.964	-	0.898	0.963
Lights	52	378	0	-	430	0	132	58	-	190	0	0	0	-	0	187	0	27	-	214	834
% Lights	100.0	96.9	-	-	97.3	-	98.5	96.7	-	97.9	-	-	-	-	-	97.4	-	100.0	-	97.7	97.5
Mediums	0	12	0	-	12	0	2	1	-	3	0	0	0	-	0	5	0	0	-	5	20
% Mediums	0.0	3.1	-	-	2.7	-	1.5	1.7	-	1.5	-	-	-	-	-	2.6	-	0.0	-	2.3	2.3
Articulated Trucks	0	0	0	-	0	0	0	1	-	1	0	0	0	-	0	0	0	0	-	0	1
% Articulated Trucks	0.0	0.0	-	-	0.0	-	0.0	1.7	-	0.5	-	-	-	-	-	0.0	-	0.0	-	0.0	0.1
Pedestrians	-	-	-	32	-	-	-	-	25	-	-	-	-	35	-	-	-	-	45	-	-
% Pedestrians	-	-	-	100.0	-	-	-	-	100.0	-	-	-	-	100.0	-	-	-	-	100.0	-	-

Turning Movement Peak Hour Data (11:45 AM)

05/20/2023	State St Eastbound					State St Westbound					Union St Northbound					Union St Southbound					
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
11:45 AM	6	84	0	9	90	0	30	12	6	42	0	0	1	4	1	48	0	0	9	48	181
12:00 PM	9	58	0	6	67	0	26	17	3	43	0	0	0	2	0	49	0	8	10	57	167
12:15 PM	10	67	0	5	77	0	41	8	9	49	0	0	0	8	0	56	0	3	6	59	185
12:30 PM	22	55	0	9	77	0	22	19	3	41	0	0	0	10	0	46	0	7	10	53	171
Total	47	264	0	29	311	0	119	56	21	175	0	0	1	24	1	199	0	18	35	217	704
Approach %	15.1	84.9	0.0	-	-	0.0	68.0	32.0	-	-	0.0	0.0	100.0	-	-	91.7	0.0	8.3	-	-	-
Total %	6.7	37.5	0.0	-	44.2	0.0	16.9	8.0	-	24.9	0.0	0.0	0.1	-	0.1	28.3	0.0	2.6	-	30.8	-
PHF	0.534	0.786	0.000	-	0.864	0.000	0.726	0.737	-	0.893	0.000	0.000	0.250	-	0.250	0.888	0.000	0.563	-	0.919	0.951
Lights	47	257	0	-	304	0	118	55	-	173	0	0	1	-	1	197	0	18	-	215	693
% Lights	100.0	97.3	-	-	97.7	-	99.2	98.2	-	98.9	-	-	100.0	-	100.0	99.0	-	100.0	-	99.1	98.4
Mediums	0	7	0	-	7	0	1	1	-	2	0	0	0	-	0	2	0	0	-	2	11
% Mediums	0.0	2.7	-	-	2.3	-	0.8	1.8	-	1.1	-	-	0.0	-	0.0	1.0	-	0.0	-	0.9	1.6
Articulated Trucks	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Articulated Trucks	0.0	0.0	-	-	0.0	-	0.0	0.0	-	0.0	-	-	0.0	-	0.0	0.0	-	0.0	-	0.0	0.0
Pedestrians	-	-	-	29	-	-	-	-	21	-	-	-	-	24	-	-	-	-	35	-	-
% Pedestrians	-	-	-	100.0	-	-	-	-	100.0	-	-	-	-	100.0	-	-	-	-	100.0	-	-

Progressive AE
1811 4 Mile Rd NE

Grand Rapids, Michigan, United States 49525
(616) 361-2664

Count Name: Union St at State St
Site Code:
Start Date: 07/27/2023

Turning Movement Data

07/27/2023	State St Eastbound					State St Westbound					Union St Northbound					Union St Southbound					
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
7:00 AM	4	33	0	3	37	0	4	3	0	7	0	0	0	1	0	8	0	2	0	10	54
7:15 AM	4	30	0	0	34	0	6	4	0	10	0	0	0	0	0	9	0	1	2	10	54
7:30 AM	6	29	0	0	35	0	13	7	2	20	0	0	1	0	1	13	0	0	1	13	69
7:45 AM	3	59	0	4	62	0	15	9	0	24	0	0	0	0	0	15	0	4	1	19	105
Hourly Total	17	151	0	7	168	0	38	23	2	61	0	0	1	1	1	45	0	7	4	52	282
8:00 AM	11	49	0	3	60	0	14	7	2	21	0	0	0	5	0	25	0	3	4	28	109
8:15 AM	10	40	0	4	50	0	9	6	6	15	0	1	0	11	1	15	0	3	4	18	84
8:30 AM	8	66	0	4	74	0	20	9	5	29	0	0	0	5	0	16	0	2	2	18	121
8:45 AM	10	68	0	2	78	0	13	9	2	22	0	2	0	3	2	20	0	1	4	21	123
Hourly Total	39	223	0	13	262	0	56	31	15	87	0	3	0	24	3	76	0	9	14	85	437
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4:00 PM	8	93	0	8	101	0	18	10	0	28	0	0	1	9	1	23	0	2	6	25	155
4:15 PM	10	70	0	17	80	0	16	13	7	29	0	1	0	5	1	25	0	1	7	26	136
4:30 PM	10	77	0	0	87	0	27	19	10	46	0	0	0	7	0	40	0	4	16	44	177
4:45 PM	12	86	0	7	98	0	40	6	10	46	0	0	0	8	0	28	1	3	7	32	176
Hourly Total	40	326	0	32	366	0	101	48	27	149	0	1	1	29	2	116	1	10	36	127	644
5:00 PM	14	69	0	10	83	0	31	16	7	47	0	0	0	6	0	23	0	5	6	28	158
5:15 PM	6	79	0	11	85	0	40	8	3	48	0	0	0	1	0	31	0	2	9	33	166
5:30 PM	10	68	0	7	78	0	30	9	34	39	0	1	0	8	1	28	0	2	13	30	148
5:45 PM	7	55	0	6	62	0	26	13	3	39	0	0	0	3	0	18	0	8	13	26	127
Hourly Total	37	271	0	34	308	0	127	46	47	173	0	1	0	18	1	100	0	17	41	117	599
07/28/2023	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11:00 AM	14	96	0	7	110	0	38	6	16	44	0	0	0	12	0	26	0	3	13	29	183
11:15 AM	20	87	0	18	107	1	31	4	10	36	1	4	2	10	7	26	0	3	27	29	179
11:30 AM	18	75	14	19	107	7	33	9	15	49	4	14	2	18	20	15	18	2	10	35	211
11:45 AM	6	65	15	8	86	6	37	10	19	53	4	15	5	11	24	14	13	3	11	30	193
Hourly Total	58	323	29	52	410	14	139	29	60	182	9	33	9	51	51	81	31	11	61	123	766
12:00 PM	11	76	16	12	103	4	31	12	6	47	1	20	2	6	23	18	19	1	12	38	211
12:15 PM	10	69	22	22	101	7	27	7	13	41	4	30	7	9	41	22	17	5	28	44	227
12:30 PM	9	67	13	6	89	2	26	15	26	43	5	21	6	20	32	27	13	5	12	45	209
12:45 PM	9	76	26	20	111	7	17	17	12	41	6	23	3	9	32	18	15	4	11	37	221
Hourly Total	39	288	77	60	404	20	101	51	57	172	16	94	18	44	128	85	64	15	63	164	868
1:00 PM	6	78	14	25	98	9	26	8	12	43	4	24	4	13	32	22	25	1	10	48	221
1:15 PM	9	73	6	27	88	8	28	19	14	55	6	28	10	4	44	17	22	1	7	40	227
1:30 PM	9	75	12	23	96	7	17	13	22	37	2	26	9	9	37	22	24	2	23	48	218
1:45 PM	15	85	7	32	107	2	34	8	11	44	5	22	10	4	37	16	17	4	14	37	225
Hourly Total	39	311	39	107	389	26	105	48	59	179	17	100	33	30	150	77	88	8	54	173	891
2:00 PM	7	70	14	38	91	11	21	15	20	47	5	17	8	20	30	22	23	5	20	50	218
2:15 PM	13	72	19	21	104	3	22	12	19	37	4	26	6	8	36	19	14	3	26	36	213
2:30 PM	4	63	13	15	80	7	22	8	25	37	4	21	7	3	32	15	22	3	19	40	189
2:45 PM	9	53	14	13	76	6	28	11	25	45	0	23	3	13	26	10	15	1	19	26	173
Hourly Total	33	258	60	87	351	27	93	46	89	166	13	87	24	44	124	66	74	12	84	152	793
3:00 PM	13	60	23	18	96	6	31	10	11	47	6	28	4	3	38	18	18	0	17	36	217
3:15 PM	10	59	18	26	87	4	32	14	29	50	5	24	4	8	33	6	13	2	15	21	191
3:30 PM	16	63	12	32	91	4	26	10	10	40	7	35	5	4	47	20	22	1	19	43	221
3:45 PM	7	59	14	22	80	7	21	12	23	40	6	26	8	12	40	27	24	7	8	58	218
Hourly Total	46	241	67	98	354	21	110	46	73	177	24	113	21	27	158	71	77	10	59	158	847
4:00 PM	8	60	7	11	75	5	19	5	12	29	3	26	12	3	41	14	19	2	15	35	180
4:15 PM	12	55	12	4	79	5	21	9	5	35	4	31	12	5	47	9	19	5	5	33	194
4:30 PM	14	59	11	9	84	7	21	8	15	36	5	32	9	3	46	17	11	3	19	31	197
4:45 PM	7	64	11	11	82	5	25	5	23	35	10	34	6	7	50	16	9	1	14	26	193
Hourly Total	41	238	41	35	320	22	86	27	55	135	22	123	39	18	184	56	58	11	53	125	764
5:00 PM	3	46	19	23	68	6	26	9	6	41	2	21	10	8	33	14	21	1	13	36	178
5:15 PM	7	44	9	12	60	5	19	7	16	31	4	27	12	2	43	16	19	4	13	39	173
5:30 PM	8	45	11	21	64	7	23	7	28	37	3	29	10	13	42	15	25	3	23	43	186
5:45 PM	5	45	9	6	59	3	22	9	23	34	4	23	8	0	35	23	10	1	19	34	162
Hourly Total	23	180	48	62	251	21	90	32	73	143	13	100	40	23	153	68	75	9	68	152	699
07/29/2023	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11:00 AM	15	58	18	24	91	4	26	8	17	38	4	26	7	6	37	24	31	3	46	58	224
11:15 AM	12	65	14	19	91	8	21	8	30	37	9	35	6	11	50	20	21	2	31	43	221

11:30 AM	9	44	7	24	60	4	19	2	47	25	5	29	8	7	42	27	27	5	26	59	186
11:45 AM	16	45	11	14	72	3	21	18	17	42	3	32	5	3	40	20	14	4	26	38	192
Hourly Total	52	212	50	81	314	19	87	36	111	142	21	122	26	27	169	91	93	14	129	198	823
12:00 PM	6	63	12	31	81	12	22	10	34	44	6	28	7	20	41	15	23	3	39	41	207
12:15 PM	5	55	14	18	74	3	19	7	43	29	8	31	11	14	50	15	30	3	40	48	201
12:30 PM	5	54	16	15	75	4	18	12	22	34	9	30	8	11	47	20	19	2	30	41	197
12:45 PM	11	45	10	12	66	9	20	8	36	37	8	25	10	5	43	23	25	2	34	50	196
Hourly Total	27	217	52	76	296	28	79	37	135	144	31	114	36	50	181	73	97	10	143	180	801
1:00 PM	8	41	6	11	55	8	20	11	30	39	7	30	8	5	45	15	19	3	32	37	176
1:15 PM	10	44	13	26	67	2	17	7	21	26	5	31	9	18	45	19	20	4	35	43	181
1:30 PM	14	51	8	23	73	3	12	8	24	23	1	31	10	6	42	9	17	6	19	32	170
1:45 PM	6	47	13	17	66	6	21	2	19	29	2	23	5	6	30	13	15	1	34	29	154
Hourly Total	38	183	40	77	261	19	70	28	94	117	15	115	32	35	162	56	71	14	120	141	681
2:00 PM	5	39	12	8	56	6	18	10	28	34	5	28	6	18	39	5	19	2	32	26	155
2:15 PM	8	39	18	2	65	6	16	8	29	30	3	26	9	4	38	19	17	1	39	37	170
2:30 PM	7	44	10	7	61	7	20	8	5	35	7	27	12	1	46	14	10	1	21	25	167
2:45 PM	7	49	10	2	66	2	15	11	31	28	3	28	8	9	39	13	17	1	4	31	164
Hourly Total	27	171	50	19	248	21	69	37	93	127	18	109	35	32	162	51	63	5	96	119	656
3:00 PM	5	47	13	11	65	1	15	5	26	21	6	16	4	16	26	15	13	5	17	33	145
3:15 PM	6	53	13	17	72	2	15	5	18	22	3	24	9	14	36	15	14	3	22	32	162
3:30 PM	12	47	8	6	67	2	17	8	11	27	3	26	10	7	39	16	16	4	18	36	169
3:45 PM	5	40	4	19	49	7	11	8	12	26	3	23	8	0	34	17	18	4	22	39	148
Hourly Total	28	187	38	53	253	12	58	26	67	96	15	89	31	37	135	63	61	16	79	140	624
4:00 PM	3	60	12	9	75	6	12	6	7	24	5	18	7	2	30	9	17	1	11	27	156
4:15 PM	7	40	7	2	54	5	11	11	8	27	5	16	4	0	25	13	11	0	13	24	130
4:30 PM	5	32	8	13	45	4	17	5	8	26	3	20	5	1	28	14	16	2	8	32	131
4:45 PM	7	53	6	16	66	3	13	8	20	24	7	25	14	2	46	19	27	1	25	47	183
Hourly Total	22	185	33	40	240	18	53	30	43	101	20	79	30	5	129	55	71	4	57	130	600
5:00 PM	9	35	7	14	51	6	10	6	20	22	3	21	5	6	29	26	24	3	17	53	155
5:15 PM	4	29	7	14	40	3	12	1	8	16	1	16	5	0	22	7	18	1	18	26	104
5:30 PM	6	56	7	12	69	3	16	5	11	24	4	7	12	0	23	22	19	1	15	42	158
5:45 PM	7	56	9	12	72	3	16	7	15	26	4	14	3	5	21	17	15	0	19	32	151
Hourly Total	26	176	30	52	232	15	54	19	54	88	12	58	25	11	95	72	76	5	69	153	568
Grand Total	632	4141	654	985	5427	283	1516	640	1154	2439	246	1341	401	506	1988	1302	1000	187	1230	2489	12343
Approach %	11.6	76.3	12.1	-	-	11.6	62.2	26.2	-	-	12.4	67.5	20.2	-	-	52.3	40.2	7.5	-	-	-
Total %	5.1	33.5	5.3	-	44.0	2.3	12.3	5.2	-	19.8	2.0	10.9	3.2	-	16.1	10.5	8.1	1.5	-	20.2	-
Lights	623	4010	643	-	5276	282	1496	625	-	2403	242	1320	400	-	1962	1257	983	186	-	2426	12067
% Lights	98.6	96.8	98.3	-	97.2	99.6	98.7	97.7	-	98.5	98.4	98.4	99.8	-	98.7	96.5	98.3	99.5	-	97.5	97.8
Mediums	7	127	11	-	145	1	20	14	-	35	4	21	1	-	26	43	17	1	-	61	267
% Mediums	1.1	3.1	1.7	-	2.7	0.4	1.3	2.2	-	1.4	1.6	1.6	0.2	-	1.3	3.3	1.7	0.5	-	2.5	2.2
Articulated Trucks	2	4	0	-	6	0	0	1	-	1	0	0	0	-	0	2	0	0	-	2	9
% Articulated Trucks	0.3	0.1	0.0	-	0.1	0.0	0.0	0.2	-	0.0	0.0	0.0	0.0	-	0.0	0.2	0.0	0.0	-	0.1	0.1
Pedestrians	-	-	-	985	-	-	-	-	1154	-	-	-	-	506	-	-	-	-	1230	-	-
% Pedestrians	-	-	-	100.0	-	-	-	-	100.0	-	-	-	-	100.0	-	-	-	-	100.0	-	-

Progressive AE
1811 4 Mile Rd NE

Grand Rapids, Michigan, United States 49525
(616) 361-2664

Count Name: Union St at State St
Site Code:
Start Date: 07/27/2023

Turning Movement Peak Hour Data (8:00 AM)

07/27/2023	State St Eastbound					State St Westbound					Union St Northbound					Union St Southbound					
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
8:00 AM	11	49	0	3	60	0	14	7	2	21	0	0	0	5	0	25	0	3	4	28	109
8:15 AM	10	40	0	4	50	0	9	6	6	15	0	1	0	11	1	15	0	3	4	18	84
8:30 AM	8	66	0	4	74	0	20	9	5	29	0	0	0	5	0	16	0	2	2	18	121
8:45 AM	10	68	0	2	78	0	13	9	2	22	0	2	0	3	2	20	0	1	4	21	123
Total	39	223	0	13	262	0	56	31	15	87	0	3	0	24	3	76	0	9	14	85	437
Approach %	14.9	85.1	0.0	-	-	0.0	64.4	35.6	-	-	0.0	100.0	0.0	-	-	89.4	0.0	10.6	-	-	-
Total %	8.9	51.0	0.0	-	60.0	0.0	12.8	7.1	-	19.9	0.0	0.7	0.0	-	0.7	17.4	0.0	2.1	-	19.5	-
PHF	0.886	0.820	0.000	-	0.840	0.000	0.700	0.861	-	0.750	0.000	0.375	0.000	-	0.375	0.760	0.000	0.750	-	0.759	0.888
Lights	37	216	0	-	253	0	55	26	-	81	0	2	0	-	2	71	0	9	-	80	416
% Lights	94.9	96.9	-	-	96.6	-	98.2	83.9	-	93.1	-	66.7	-	-	66.7	93.4	-	100.0	-	94.1	95.2
Mediums	2	7	0	-	9	0	1	5	-	6	0	1	0	-	1	4	0	0	-	4	20
% Mediums	5.1	3.1	-	-	3.4	-	1.8	16.1	-	6.9	-	33.3	-	-	33.3	5.3	-	0.0	-	4.7	4.6
Articulated Trucks	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	1	0	0	-	1	1
% Articulated Trucks	0.0	0.0	-	-	0.0	-	0.0	0.0	-	0.0	-	0.0	-	-	0.0	1.3	-	0.0	-	1.2	0.2
Pedestrians	-	-	-	13	-	-	-	-	15	-	-	-	-	24	-	-	-	-	14	-	-
% Pedestrians	-	-	-	100.0	-	-	-	-	100.0	-	-	-	-	100.0	-	-	-	-	100.0	-	-

Turning Movement Peak Hour Data (4:30 PM)

07/27/2023	State St Eastbound					State St Westbound					Union St Northbound					Union St Southbound					
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
4:30 PM	10	77	0	0	87	0	27	19	10	46	0	0	0	7	0	40	0	4	16	44	177
4:45 PM	12	86	0	7	98	0	40	6	10	46	0	0	0	8	0	28	1	3	7	32	176
5:00 PM	14	69	0	10	83	0	31	16	7	47	0	0	0	6	0	23	0	5	6	28	158
5:15 PM	6	79	0	11	85	0	40	8	3	48	0	0	0	1	0	31	0	2	9	33	166
Total	42	311	0	28	353	0	138	49	30	187	0	0	0	22	0	122	1	14	38	137	677
Approach %	11.9	88.1	0.0	-	-	0.0	73.8	26.2	-	-	0.0	0.0	0.0	-	-	89.1	0.7	10.2	-	-	-
Total %	6.2	45.9	0.0	-	52.1	0.0	20.4	7.2	-	27.6	0.0	0.0	0.0	-	0.0	18.0	0.1	2.1	-	20.2	-
PHF	0.750	0.904	0.000	-	0.901	0.000	0.863	0.645	-	0.974	0.000	0.000	0.000	-	0.000	0.763	0.250	0.700	-	0.778	0.956
Lights	42	304	0	-	346	0	138	48	-	186	0	0	0	-	0	118	1	14	-	133	665
% Lights	100.0	97.7	-	-	98.0	-	100.0	98.0	-	99.5	-	-	-	-	-	96.7	100.0	100.0	-	97.1	98.2
Mediums	0	7	0	-	7	0	0	1	-	1	0	0	0	-	0	4	0	0	-	4	12
% Mediums	0.0	2.3	-	-	2.0	-	0.0	2.0	-	0.5	-	-	-	-	-	3.3	0.0	0.0	-	2.9	1.8
Articulated Trucks	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Articulated Trucks	0.0	0.0	-	-	0.0	-	0.0	0.0	-	0.0	-	-	-	-	-	0.0	0.0	0.0	-	0.0	0.0
Pedestrians	-	-	-	28	-	-	-	-	30	-	-	-	-	22	-	-	-	-	38	-	-
% Pedestrians	-	-	-	100.0	-	-	-	-	100.0	-	-	-	-	100.0	-	-	-	-	100.0	-	-

Progressive AE
1811 4 Mile Rd NE

Grand Rapids, Michigan, United States 49525
(616) 361-2664

Count Name: Union St at State St
Site Code:
Start Date: 07/27/2023

Turning Movement Peak Hour Data (1:00 PM)

07/28/2023	State St Eastbound					State St Westbound					Union St Northbound					Union St Southbound					
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
1:00 PM	6	78	14	25	98	9	26	8	12	43	4	24	4	13	32	22	25	1	10	48	221
1:15 PM	9	73	6	27	88	8	28	19	14	55	6	28	10	4	44	17	22	1	7	40	227
1:30 PM	9	75	12	23	96	7	17	13	22	37	2	26	9	9	37	22	24	2	23	48	218
1:45 PM	15	85	7	32	107	2	34	8	11	44	5	22	10	4	37	16	17	4	14	37	225
Total	39	311	39	107	389	26	105	48	59	179	17	100	33	30	150	77	88	8	54	173	891
Approach %	10.0	79.9	10.0	-	-	14.5	58.7	26.8	-	-	11.3	66.7	22.0	-	-	44.5	50.9	4.6	-	-	-
Total %	4.4	34.9	4.4	-	43.7	2.9	11.8	5.4	-	20.1	1.9	11.2	3.7	-	16.8	8.6	9.9	0.9	-	19.4	-
PHF	0.650	0.915	0.696	-	0.909	0.722	0.772	0.632	-	0.814	0.708	0.893	0.825	-	0.852	0.875	0.880	0.500	-	0.901	0.981
Lights	39	298	38	-	375	26	102	46	-	174	16	99	33	-	148	75	85	8	-	168	865
% Lights	100.0	95.8	97.4	-	96.4	100.0	97.1	95.8	-	97.2	94.1	99.0	100.0	-	98.7	97.4	96.6	100.0	-	97.1	97.1
Mediums	0	13	1	-	14	0	3	1	-	4	1	1	0	-	2	2	3	0	-	5	25
% Mediums	0.0	4.2	2.6	-	3.6	0.0	2.9	2.1	-	2.2	5.9	1.0	0.0	-	1.3	2.6	3.4	0.0	-	2.9	2.8
Articulated Trucks	0	0	0	-	0	0	0	1	-	1	0	0	0	-	0	0	0	0	-	0	1
% Articulated Trucks	0.0	0.0	0.0	-	0.0	0.0	0.0	2.1	-	0.6	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.1
Pedestrians	-	-	-	107	-	-	-	-	59	-	-	-	-	30	-	-	-	-	54	-	-
% Pedestrians	-	-	-	100.0	-	-	-	-	100.0	-	-	-	-	100.0	-	-	-	-	100.0	-	-

Turning Movement Peak Hour Data (11:00 AM)

07/29/2023	State St Eastbound					State St Westbound					Union St Northbound					Union St Southbound					
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
11:00 AM	15	58	18	24	91	4	26	8	17	38	4	26	7	6	37	24	31	3	46	58	224
11:15 AM	12	65	14	19	91	8	21	8	30	37	9	35	6	11	50	20	21	2	31	43	221
11:30 AM	9	44	7	24	60	4	19	2	47	25	5	29	8	7	42	27	27	5	26	59	186
11:45 AM	16	45	11	14	72	3	21	18	17	42	3	32	5	3	40	20	14	4	26	38	192
Total	52	212	50	81	314	19	87	36	111	142	21	122	26	27	169	91	93	14	129	198	823
Approach %	16.6	67.5	15.9	-	-	13.4	61.3	25.4	-	-	12.4	72.2	15.4	-	-	46.0	47.0	7.1	-	-	-
Total %	6.3	25.8	6.1	-	38.2	2.3	10.6	4.4	-	17.3	2.6	14.8	3.2	-	20.5	11.1	11.3	1.7	-	24.1	-
PHF	0.813	0.815	0.694	-	0.863	0.594	0.837	0.500	-	0.845	0.583	0.871	0.813	-	0.845	0.843	0.750	0.700	-	0.839	0.919
Lights	52	209	50	-	311	19	87	36	-	142	21	120	26	-	167	88	92	14	-	194	814
% Lights	100.0	98.6	100.0	-	99.0	100.0	100.0	100.0	-	100.0	100.0	98.4	100.0	-	98.8	96.7	98.9	100.0	-	98.0	98.9
Mediums	0	3	0	-	3	0	0	0	-	0	0	2	0	-	2	2	1	0	-	3	8
% Mediums	0.0	1.4	0.0	-	1.0	0.0	0.0	0.0	-	0.0	0.0	1.6	0.0	-	1.2	2.2	1.1	0.0	-	1.5	1.0
Articulated Trucks	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	1	0	0	-	1	1
% Articulated Trucks	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	1.1	0.0	0.0	-	0.5	0.1
Pedestrians	-	-	-	81	-	-	-	-	111	-	-	-	-	27	-	-	-	-	129	-	-
% Pedestrians	-	-	-	100.0	-	-	-	-	100.0	-	-	-	-	100.0	-	-	-	-	100.0	-	-

Progressive AE
1811 4 Mile Rd NE

Grand Rapids, Michigan, United States 49525
(616) 361-2664

Count Name: Pine St at Front St
Site Code:
Start Date: 07/15/2021

Turning Movement Data

Start Time	Front St Eastbound				Front St Westbound				Pine St Northbound				
	Thru	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Left	Right	Peds	App. Total	Int. Total
7:00 AM	0	41	0	41	7	30	3	37	0	0	0	0	78
7:15 AM	0	41	0	41	6	36	4	42	0	0	2	0	83
7:30 AM	0	50	1	50	5	45	2	50	0	0	1	0	100
7:45 AM	0	79	1	79	13	71	3	84	0	0	2	0	163
Hourly Total	0	211	2	211	31	182	12	213	0	0	5	0	424
8:00 AM	0	66	1	66	13	50	7	63	0	0	9	0	129
8:15 AM	0	51	0	51	11	57	4	68	0	0	5	0	119
8:30 AM	0	81	0	81	13	55	3	68	0	0	7	0	149
8:45 AM	0	93	0	93	21	64	15	85	0	0	11	0	178
Hourly Total	0	291	1	291	58	226	29	284	0	0	32	0	575
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-
4:00 PM	0	115	5	115	16	107	9	123	0	0	13	0	238
4:15 PM	0	112	5	112	22	154	10	176	0	0	16	0	288
4:30 PM	0	122	9	122	24	128	8	152	0	0	22	0	274
4:45 PM	0	123	6	123	14	115	7	129	0	0	39	0	252
Hourly Total	0	472	25	472	76	504	34	580	0	0	90	0	1052
5:00 PM	0	96	5	96	11	126	9	137	0	0	40	0	233
5:15 PM	0	112	5	112	12	120	6	132	0	0	24	0	244
5:30 PM	0	92	1	92	9	135	12	144	0	0	51	0	236
5:45 PM	0	99	8	99	10	101	4	111	0	0	24	0	210
Hourly Total	0	399	19	399	42	482	31	524	0	0	139	0	923
Grand Total	0	1373	47	1373	207	1394	106	1601	0	0	266	0	2974
Approach %	0.0	100.0	-	-	12.9	87.1	-	-	0.0	0.0	-	-	-
Total %	0.0	46.2	-	46.2	7.0	46.9	-	53.8	0.0	0.0	-	0.0	-
Lights	0	1365	-	1365	177	1339	-	1516	0	0	-	0	2881
% Lights	-	99.4	-	99.4	85.5	96.1	-	94.7	-	-	-	-	96.9
Mediums	0	6	-	6	29	54	-	83	0	0	-	0	89
% Mediums	-	0.4	-	0.4	14.0	3.9	-	5.2	-	-	-	-	3.0
Articulated Trucks	0	2	-	2	1	1	-	2	0	0	-	0	4
% Articulated Trucks	-	0.1	-	0.1	0.5	0.1	-	0.1	-	-	-	-	0.1
Pedestrians	-	-	47	-	-	-	106	-	-	-	266	-	-
% Pedestrians	-	-	100.0	-	-	-	100.0	-	-	-	100.0	-	-

Progressive AE
1811 4 Mile Rd NE

Grand Rapids, Michigan, United States 49525
(616) 361-2664

Count Name: Pine St at Front St
Site Code:
Start Date: 07/15/2021

Turning Movement Peak Hour Data (8:00 AM)

Start Time	Front St Eastbound				Front St Westbound				Pine St Northbound				
	Thru	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Left	Right	Peds	App. Total	Int. Total
8:00 AM	0	66	1	66	13	50	7	63	0	0	9	0	129
8:15 AM	0	51	0	51	11	57	4	68	0	0	5	0	119
8:30 AM	0	81	0	81	13	55	3	68	0	0	7	0	149
8:45 AM	0	93	0	93	21	64	15	85	0	0	11	0	178
Total	0	291	1	291	58	226	29	284	0	0	32	0	575
Approach %	0.0	100.0	-	-	20.4	79.6	-	-	0.0	0.0	-	-	-
Total %	0.0	50.6	-	50.6	10.1	39.3	-	49.4	0.0	0.0	-	0.0	-
PHF	0.000	0.782	-	0.782	0.690	0.883	-	0.835	0.000	0.000	-	0.000	0.808
Lights	0	287	-	287	47	207	-	254	0	0	-	0	541
% Lights	-	98.6	-	98.6	81.0	91.6	-	89.4	-	-	-	-	94.1
Mediums	0	2	-	2	10	18	-	28	0	0	-	0	30
% Mediums	-	0.7	-	0.7	17.2	8.0	-	9.9	-	-	-	-	5.2
Articulated Trucks	0	2	-	2	1	1	-	2	0	0	-	0	4
% Articulated Trucks	-	0.7	-	0.7	1.7	0.4	-	0.7	-	-	-	-	0.7
Pedestrians	-	-	1	-	-	-	29	-	-	-	32	-	-
% Pedestrians	-	-	100.0	-	-	-	100.0	-	-	-	100.0	-	-

Progressive AE
1811 4 Mile Rd NE

Grand Rapids, Michigan, United States 49525
(616) 361-2664

Count Name: Pine St at Front St
Site Code:
Start Date: 07/15/2021

Turning Movement Peak Hour Data (4:00 PM)

Start Time	Front St Eastbound				Front St Westbound				Pine St Northbound				
	Thru	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Left	Right	Peds	App. Total	Int. Total
4:00 PM	0	115	5	115	16	107	9	123	0	0	13	0	238
4:15 PM	0	112	5	112	22	154	10	176	0	0	16	0	288
4:30 PM	0	122	9	122	24	128	8	152	0	0	22	0	274
4:45 PM	0	123	6	123	14	115	7	129	0	0	39	0	252
Total	0	472	25	472	76	504	34	580	0	0	90	0	1052
Approach %	0.0	100.0	-	-	13.1	86.9	-	-	0.0	0.0	-	-	-
Total %	0.0	44.9	-	44.9	7.2	47.9	-	55.1	0.0	0.0	-	0.0	-
PHF	0.000	0.959	-	0.959	0.792	0.818	-	0.824	0.000	0.000	-	0.000	0.913
Lights	0	470	-	470	68	489	-	557	0	0	-	0	1027
% Lights	-	99.6	-	99.6	89.5	97.0	-	96.0	-	-	-	-	97.6
Mediums	0	2	-	2	8	15	-	23	0	0	-	0	25
% Mediums	-	0.4	-	0.4	10.5	3.0	-	4.0	-	-	-	-	2.4
Articulated Trucks	0	0	-	0	0	0	-	0	0	0	-	0	0
% Articulated Trucks	-	0.0	-	0.0	0.0	0.0	-	0.0	-	-	-	-	0.0
Pedestrians	-	-	25	-	-	-	34	-	-	-	90	-	-
% Pedestrians	-	-	100.0	-	-	-	100.0	-	-	-	100.0	-	-

Progressive AE
1811 4 Mile Rd NE

Grand Rapids, Michigan, United States 49525
(616) 361-2664

Count Name: Pine St at Front St
Site Code:
Start Date: 03/02/2023

Turning Movement Data

03/02/2023	Front St Eastbound				Front St Westbound				Pine St Northbound			
	Left	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Left	Peds	App. Total	Int. Total
7:00 AM	0	32	5	32	8	11	1	19	2	3	2	53
7:15 AM	0	46	4	46	4	26	3	30	5	0	5	81
7:30 AM	0	57	5	57	6	34	2	40	10	0	10	107
7:45 AM	0	70	3	70	3	37	4	40	7	0	7	117
Hourly Total	0	205	17	205	21	108	10	129	24	3	24	358
8:00 AM	0	78	0	78	12	42	5	54	6	0	6	138
8:15 AM	0	70	4	70	6	35	4	41	7	2	7	118
8:30 AM	0	55	3	55	8	23	6	31	11	0	11	97
8:45 AM	0	74	1	74	3	31	3	34	15	0	15	123
Hourly Total	0	277	8	277	29	131	18	160	39	2	39	476
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-
4:00 PM	0	90	10	90	11	58	4	69	30	0	30	189
4:15 PM	0	69	5	69	4	73	5	77	29	0	29	175
4:30 PM	0	90	4	90	9	69	0	78	24	0	24	192
4:45 PM	0	90	2	90	5	63	3	68	28	0	28	186
Hourly Total	0	339	21	339	29	263	12	292	111	0	111	742
5:00 PM	0	76	1	76	9	81	5	90	32	1	32	198
5:15 PM	0	84	3	84	6	69	1	75	22	0	22	181
5:30 PM	0	68	4	68	6	61	6	67	22	1	22	157
5:45 PM	0	71	1	71	6	53	3	59	22	0	22	152
Hourly Total	0	299	9	299	27	264	15	291	98	2	98	688
03/03/2023	-	-	-	-	-	-	-	-	-	-	-	-
11:00 AM	0	76	6	76	7	80	5	87	15	1	15	178
11:15 AM	0	92	9	92	13	68	3	81	16	0	16	189
11:30 AM	0	93	19	93	8	75	1	83	14	2	14	190
11:45 AM	0	104	11	104	7	74	3	81	24	0	24	209
Hourly Total	0	365	45	365	35	297	12	332	69	3	69	766
12:00 PM	0	95	15	95	8	73	6	81	28	0	28	204
12:15 PM	0	96	8	96	11	74	5	85	23	0	23	204
12:30 PM	0	101	5	101	14	65	1	79	31	0	31	211
12:45 PM	0	97	8	97	11	83	5	94	25	0	25	216
Hourly Total	0	389	36	389	44	295	17	339	107	0	107	835
1:00 PM	0	76	8	76	16	72	9	88	26	0	26	190
1:15 PM	0	82	3	82	13	75	8	88	26	2	26	196
1:30 PM	0	92	15	92	9	65	0	74	29	0	29	195
1:45 PM	0	80	1	80	7	84	1	91	24	0	24	195
Hourly Total	0	330	27	330	45	296	18	341	105	2	105	776
2:00 PM	0	108	7	108	4	76	3	80	27	0	27	215
2:15 PM	0	69	5	69	8	70	5	78	20	0	20	167
2:30 PM	0	103	3	103	7	60	2	67	35	0	35	205
2:45 PM	0	106	16	106	10	82	1	92	37	0	37	235
Hourly Total	0	386	31	386	29	288	11	317	119	0	119	822
3:00 PM	0	83	13	83	8	70	0	78	19	0	19	180
3:15 PM	0	89	0	89	11	70	3	81	23	0	23	193
3:30 PM	0	102	4	102	5	69	6	74	26	0	26	202
3:45 PM	0	102	4	102	7	75	4	82	34	0	34	218
Hourly Total	0	376	21	376	31	284	13	315	102	0	102	793
4:00 PM	0	89	5	89	8	85	4	93	43	0	43	225
4:15 PM	0	83	5	83	5	61	3	66	32	0	32	181
4:30 PM	0	88	3	88	11	70	2	81	25	0	25	194
4:45 PM	0	92	5	92	8	56	3	64	30	0	30	186
Hourly Total	0	352	18	352	32	272	12	304	130	0	130	786
5:00 PM	0	81	3	81	7	66	5	73	36	1	36	190
5:15 PM	0	87	6	87	7	64	2	71	33	1	33	191
5:30 PM	0	82	1	82	10	74	7	84	27	1	27	193
5:45 PM	0	80	1	80	8	49	7	57	24	0	24	161
Hourly Total	0	330	11	330	32	253	21	285	120	3	120	735
03/04/2023	-	-	-	-	-	-	-	-	-	-	-	-
11:00 AM	0	68	5	68	5	58	2	63	30	1	30	161
11:15 AM	0	63	0	63	5	64	3	69	17	0	17	149
11:30 AM	0	73	3	73	6	57	5	63	17	3	17	153

11:45 AM	1	74	8	75	3	73	2	76	26	1	26	177
Hourly Total	1	278	16	279	19	252	12	271	90	5	90	640
12:00 PM	0	61	10	61	8	77	3	85	25	0	25	171
12:15 PM	0	82	8	82	9	71	2	80	36	0	36	198
12:30 PM	0	82	10	82	15	66	11	81	18	0	18	181
12:45 PM	0	70	2	70	7	71	3	78	24	4	24	172
Hourly Total	0	295	30	295	39	285	19	324	103	4	103	722
1:00 PM	0	82	15	82	8	74	11	82	24	6	24	188
1:15 PM	0	74	4	74	5	79	11	84	28	0	28	186
1:30 PM	0	74	13	74	6	60	1	66	24	6	24	164
1:45 PM	0	85	7	85	4	51	13	55	26	1	26	166
Hourly Total	0	315	39	315	23	264	36	287	102	13	102	704
2:00 PM	0	73	5	73	6	54	5	60	21	5	21	154
2:15 PM	0	82	5	82	8	57	9	65	28	7	28	175
2:30 PM	0	77	0	77	8	72	3	80	22	1	22	179
2:45 PM	0	76	9	76	5	67	2	72	19	3	19	167
Hourly Total	0	308	19	308	27	250	19	277	90	16	90	675
3:00 PM	0	69	3	69	0	67	8	67	23	0	23	159
3:15 PM	0	61	0	61	4	79	4	83	24	0	24	168
3:30 PM	0	56	4	56	3	77	1	80	17	0	17	153
3:45 PM	0	67	0	67	8	56	6	64	21	1	21	152
Hourly Total	0	253	7	253	15	279	19	294	85	1	85	632
4:00 PM	0	66	3	66	6	63	7	69	18	0	18	153
4:15 PM	0	78	3	78	2	67	1	69	14	0	14	161
4:30 PM	0	64	2	64	10	70	12	80	21	0	21	165
4:45 PM	0	80	4	80	4	61	4	65	25	0	25	170
Hourly Total	0	288	12	288	22	261	24	283	78	0	78	649
5:00 PM	0	73	1	73	4	55	2	59	32	2	32	164
5:15 PM	0	62	6	62	6	53	5	59	16	4	16	137
5:30 PM	0	58	5	58	7	47	2	54	19	0	19	131
5:45 PM	0	64	2	64	6	52	0	58	26	0	26	148
Hourly Total	0	257	14	257	23	207	9	230	93	6	93	580
Grand Total	1	5642	381	5643	522	4549	297	5071	1665	60	1665	12379
Approach %	0.0	100.0	-	-	10.3	89.7	-	-	100.0	-	-	-
Total %	0.0	45.6	-	45.6	4.2	36.7	-	41.0	13.5	-	13.5	-
Lights	1	5583	-	5584	437	4391	-	4828	1648	-	1648	12060
% Lights	100.0	99.0	-	99.0	83.7	96.5	-	95.2	99.0	-	99.0	97.4
Mediums	0	55	-	55	83	151	-	234	15	-	15	304
% Mediums	0.0	1.0	-	1.0	15.9	3.3	-	4.6	0.9	-	0.9	2.5
Articulated Trucks	0	4	-	4	2	7	-	9	2	-	2	15
% Articulated Trucks	0.0	0.1	-	0.1	0.4	0.2	-	0.2	0.1	-	0.1	0.1
Pedestrians	-	-	381	-	-	-	297	-	-	60	-	-
% Pedestrians	-	-	100.0	-	-	-	100.0	-	-	100.0	-	-

Progressive AE
1811 4 Mile Rd NE

Grand Rapids, Michigan, United States 49525
(616) 361-2664

Count Name: Pine St at Front St
Site Code:
Start Date: 03/02/2023

Turning Movement Peak Hour Data (7:30 AM)

03/02/2023	Front St Eastbound				Front St Westbound				Pine St Northbound			
	Left	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Left	Peds	App. Total	Int. Total
7:30 AM	0	57	5	57	6	34	2	40	10	0	10	107
7:45 AM	0	70	3	70	3	37	4	40	7	0	7	117
8:00 AM	0	78	0	78	12	42	5	54	6	0	6	138
8:15 AM	0	70	4	70	6	35	4	41	7	2	7	118
Total	0	275	12	275	27	148	15	175	30	2	30	480
Approach %	0.0	100.0	-	-	15.4	84.6	-	-	100.0	-	-	-
Total %	0.0	57.3	-	57.3	5.6	30.8	-	36.5	6.3	-	6.3	-
PHF	0.000	0.881	-	0.881	0.563	0.881	-	0.810	0.750	-	0.750	0.870
Lights	0	269	-	269	22	132	-	154	27	-	27	450
% Lights	-	97.8	-	97.8	81.5	89.2	-	88.0	90.0	-	90.0	93.8
Mediums	0	5	-	5	4	15	-	19	2	-	2	26
% Mediums	-	1.8	-	1.8	14.8	10.1	-	10.9	6.7	-	6.7	5.4
Articulated Trucks	0	1	-	1	1	1	-	2	1	-	1	4
% Articulated Trucks	-	0.4	-	0.4	3.7	0.7	-	1.1	3.3	-	3.3	0.8
Pedestrians	-	-	12	-	-	-	15	-	-	2	-	-
% Pedestrians	-	-	100.0	-	-	-	100.0	-	-	100.0	-	-

Turning Movement Peak Hour Data (4:30 PM)

03/02/2023	Front St Eastbound				Front St Westbound				Pine St Northbound			
	Left	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Left	Peds	App. Total	Int. Total
4:30 PM	0	90	4	90	9	69	0	78	24	0	24	192
4:45 PM	0	90	2	90	5	63	3	68	28	0	28	186
5:00 PM	0	76	1	76	9	81	5	90	32	1	32	198
5:15 PM	0	84	3	84	6	69	1	75	22	0	22	181
Total	0	340	10	340	29	282	9	311	106	1	106	757
Approach %	0.0	100.0	-	-	9.3	90.7	-	-	100.0	-	-	-
Total %	0.0	44.9	-	44.9	3.8	37.3	-	41.1	14.0	-	14.0	-
PHF	0.000	0.944	-	0.944	0.806	0.870	-	0.864	0.828	-	0.828	0.956
Lights	0	335	-	335	23	270	-	293	106	-	106	734
% Lights	-	98.5	-	98.5	79.3	95.7	-	94.2	100.0	-	100.0	97.0
Mediums	0	5	-	5	6	11	-	17	0	-	0	22
% Mediums	-	1.5	-	1.5	20.7	3.9	-	5.5	0.0	-	0.0	2.9
Articulated Trucks	0	0	-	0	0	1	-	1	0	-	0	1
% Articulated Trucks	-	0.0	-	0.0	0.0	0.4	-	0.3	0.0	-	0.0	0.1
Pedestrians	-	-	10	-	-	-	9	-	-	1	-	-
% Pedestrians	-	-	100.0	-	-	-	100.0	-	-	100.0	-	-

Progressive AE
1811 4 Mile Rd NE

Grand Rapids, Michigan, United States 49525
(616) 361-2664

Count Name: Pine St at Front St
Site Code:
Start Date: 03/02/2023

Turning Movement Peak Hour Data (3:15 PM)

03/03/2023	Front St Eastbound				Front St Westbound				Pine St Northbound			
	Left	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Left	Peds	App. Total	Int. Total
3:15 PM	0	89	0	89	11	70	3	81	23	0	23	193
3:30 PM	0	102	4	102	5	69	6	74	26	0	26	202
3:45 PM	0	102	4	102	7	75	4	82	34	0	34	218
4:00 PM	0	89	5	89	8	85	4	93	43	0	43	225
Total	0	382	13	382	31	299	17	330	126	0	126	838
Approach %	0.0	100.0	-	-	9.4	90.6	-	-	100.0	-	-	-
Total %	0.0	45.6	-	45.6	3.7	35.7	-	39.4	15.0	-	15.0	-
PHF	0.000	0.936	-	0.936	0.705	0.879	-	0.887	0.733	-	0.733	0.931
Lights	0	379	-	379	26	284	-	310	126	-	126	815
% Lights	-	99.2	-	99.2	83.9	95.0	-	93.9	100.0	-	100.0	97.3
Mediums	0	3	-	3	5	14	-	19	0	-	0	22
% Mediums	-	0.8	-	0.8	16.1	4.7	-	5.8	0.0	-	0.0	2.6
Articulated Trucks	0	0	-	0	0	1	-	1	0	-	0	1
% Articulated Trucks	-	0.0	-	0.0	0.0	0.3	-	0.3	0.0	-	0.0	0.1
Pedestrians	-	-	13	-	-	-	17	-	-	0	-	-
% Pedestrians	-	-	100.0	-	-	-	100.0	-	-	-	-	-

Turning Movement Peak Hour Data (12:15 PM)

03/04/2023	Front St Eastbound				Front St Westbound				Pine St Northbound			
	Left	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Left	Peds	App. Total	Int. Total
12:15 PM	0	82	8	82	9	71	2	80	36	0	36	198
12:30 PM	0	82	10	82	15	66	11	81	18	0	18	181
12:45 PM	0	70	2	70	7	71	3	78	24	4	24	172
1:00 PM	0	82	15	82	8	74	11	82	24	6	24	188
Total	0	316	35	316	39	282	27	321	102	10	102	739
Approach %	0.0	100.0	-	-	12.1	87.9	-	-	100.0	-	-	-
Total %	0.0	42.8	-	42.8	5.3	38.2	-	43.4	13.8	-	13.8	-
PHF	0.000	0.963	-	0.963	0.650	0.953	-	0.979	0.708	-	0.708	0.933
Lights	0	315	-	315	37	278	-	315	100	-	100	730
% Lights	-	99.7	-	99.7	94.9	98.6	-	98.1	98.0	-	98.0	98.8
Mediums	0	1	-	1	2	4	-	6	2	-	2	9
% Mediums	-	0.3	-	0.3	5.1	1.4	-	1.9	2.0	-	2.0	1.2
Articulated Trucks	0	0	-	0	0	0	-	0	0	-	0	0
% Articulated Trucks	-	0.0	-	0.0	0.0	0.0	-	0.0	0.0	-	0.0	0.0
Pedestrians	-	-	35	-	-	-	27	-	-	10	-	-
% Pedestrians	-	-	100.0	-	-	-	100.0	-	-	100.0	-	-

Progressive AE
1811 4 Mile Rd NE

Grand Rapids, Michigan, United States 49525
(616) 361-2664

Count Name: Pine St at Front St
Site Code:
Start Date: 05/18/2023

Turning Movement Data

05/18/2023	Eastbound St. Eastbound			Westbound St. Westbound				Northbound St. Northbound			
	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Left	Peds	App. Total	Int. Total
7:00 AM	30	2	30	3	17	2	20	6	2	6	56
7:15 AM	42	9	42	4	33	4	37	8	2	8	87
7:30 AM	62	7	62	5	33	3	38	18	8	18	118
7:45 AM	79	6	79	5	38	9	43	11	10	11	133
Hourly Total	213	24	213	17	121	18	138	43	22	43	394
8:00 AM	67	0	67	11	41	1	52	9	12	9	128
8:15 AM	78	1	78	10	49	11	59	15	14	15	152
8:30 AM	72	5	72	4	46	4	50	20	9	20	142
8:45 AM	74	9	74	6	39	4	45	23	11	23	142
Hourly Total	291	15	291	31	175	20	206	67	46	67	564
05/18/2023	-	-	-	-	-	-	-	-	-	-	-
4:00 PM	100	5	100	7	65	6	72	27	6	27	199
4:15 PM	78	3	78	11	69	2	80	27	10	27	185
4:30 PM	78	0	78	11	64	3	75	29	50	29	182
4:45 PM	83	1	83	3	78	9	81	33	10	33	197
Hourly Total	339	9	339	32	276	20	308	116	76	116	763
5:00 PM	85	8	85	10	92	21	102	46	28	46	233
5:15 PM	86	5	86	9	63	8	72	22	3	22	180
5:30 PM	71	7	71	7	71	6	78	28	35	28	177
5:45 PM	63	3	63	8	64	3	72	32	31	32	167
Hourly Total	305	23	305	34	290	38	324	128	97	128	757
05/19/2023	-	-	-	-	-	-	-	-	-	-	-
11:00 AM	90	7	90	15	88	2	103	28	4	28	221
11:15 AM	102	3	102	12	76	8	88	30	2	30	220
11:30 AM	90	6	90	12	77	2	89	30	13	30	209
11:45 AM	97	15	97	11	85	9	96	32	10	32	225
Hourly Total	379	31	379	50	326	21	376	120	29	120	875
12:00 PM	100	5	100	12	86	6	98	37	18	37	235
12:15 PM	109	9	109	8	94	6	102	40	9	40	251
12:30 PM	112	12	112	12	94	4	106	41	16	41	259
12:45 PM	105	10	105	18	76	5	94	35	11	35	234
Hourly Total	426	36	426	50	350	21	400	153	54	153	979
1:00 PM	111	12	111	13	72	5	85	42	6	42	238
1:15 PM	95	6	95	10	75	2	85	36	13	36	216
1:30 PM	96	13	96	12	70	9	82	40	4	40	218
1:45 PM	100	5	100	8	93	5	101	37	18	37	238
Hourly Total	402	36	402	43	310	21	353	155	41	155	910
2:00 PM	94	6	94	10	86	5	96	33	15	33	223
2:15 PM	92	3	92	14	89	5	103	33	11	33	228
2:30 PM	87	5	87	8	77	8	85	40	8	40	212
2:45 PM	97	4	97	12	85	3	97	37	14	37	231
Hourly Total	370	18	370	44	337	21	381	143	48	143	894
3:00 PM	86	0	86	12	92	1	104	40	14	40	230
3:15 PM	109	3	109	10	86	15	96	24	7	24	229
3:30 PM	97	8	97	15	74	7	89	29	18	29	215
3:45 PM	103	7	103	9	79	2	88	35	11	35	226
Hourly Total	395	18	395	46	331	25	377	128	50	128	900
4:00 PM	82	7	82	13	63	6	76	41	9	41	199
4:15 PM	92	2	92	10	82	3	92	27	13	27	211
4:30 PM	70	3	70	11	75	5	86	23	9	23	179
4:45 PM	91	1	91	1	74	4	75	46	13	46	212
Hourly Total	335	13	335	35	294	18	329	137	44	137	801
5:00 PM	96	0	96	6	80	12	86	35	23	35	217
5:15 PM	72	3	72	10	73	4	83	36	27	36	191
5:30 PM	64	1	64	8	56	5	64	30	17	30	158
5:45 PM	57	7	57	7	63	1	70	31	12	31	158
Hourly Total	289	11	289	31	272	22	303	132	79	132	724
05/20/2023	-	-	-	-	-	-	-	-	-	-	-
11:00 AM	67	6	67	11	64	1	75	23	14	23	165
11:15 AM	65	3	65	10	71	1	81	32	4	32	178
11:30 AM	63	1	63	9	85	3	94	20	13	20	177

11:45 AM	80	2	80	15	90	7	105	32	22	32	217
Hourly Total	275	12	275	45	310	12	355	107	53	107	737
12:00 PM	77	14	77	8	80	9	88	31	15	31	196
12:15 PM	76	8	76	4	77	6	81	41	18	41	198
12:30 PM	66	5	66	11	82	7	93	30	25	30	189
12:45 PM	79	3	79	5	88	4	93	28	16	28	200
Hourly Total	298	30	298	28	327	26	355	130	74	130	783
1:00 PM	71	8	71	6	62	6	68	34	14	34	173
1:15 PM	73	13	73	14	73	13	87	30	32	30	190
1:30 PM	79	5	79	6	72	5	78	32	20	32	189
1:45 PM	63	2	63	11	48	10	59	35	30	35	157
Hourly Total	286	28	286	37	255	34	292	131	96	131	709
2:00 PM	76	7	76	7	65	5	72	32	31	32	180
2:15 PM	74	0	74	11	62	9	73	36	17	36	183
2:30 PM	80	9	80	8	79	3	87	22	13	22	189
2:45 PM	65	4	65	10	56	12	66	27	22	27	158
Hourly Total	295	20	295	36	262	29	298	117	83	117	710
3:00 PM	73	4	73	3	66	3	69	24	9	24	166
3:15 PM	64	10	64	7	70	5	77	25	18	25	166
3:30 PM	53	4	53	9	60	6	69	31	12	31	153
3:45 PM	76	6	76	8	85	4	93	26	33	26	195
Hourly Total	266	24	266	27	281	18	308	106	72	106	680
4:00 PM	76	4	76	11	66	18	77	28	13	28	181
4:15 PM	66	3	66	6	79	1	85	25	34	25	176
4:30 PM	65	9	65	8	55	7	63	24	17	24	152
4:45 PM	66	2	66	6	69	3	75	18	23	18	159
Hourly Total	273	18	273	31	269	29	300	95	87	95	668
5:00 PM	60	12	60	3	64	8	67	24	21	24	151
5:15 PM	56	22	56	6	65	15	71	15	31	15	142
5:30 PM	58	1	58	5	54	8	59	17	40	17	134
5:45 PM	55	9	55	12	64	5	76	15	18	15	146
Hourly Total	229	44	229	26	247	36	273	71	110	71	573
Grand Total	5666	410	5666	643	5033	429	5676	2079	1161	2079	13421
Approach %	100.0	-	-	11.3	88.7	-	-	100.0	-	-	-
Total %	42.2	-	42.2	4.8	37.5	-	42.3	15.5	-	15.5	-
Lights	5598	-	5598	554	4867	-	5421	2061	-	2061	13080
% Lights	98.8	-	98.8	86.2	96.7	-	95.5	99.1	-	99.1	97.5
Mediums	61	-	61	88	156	-	244	17	-	17	322
% Mediums	1.1	-	1.1	13.7	3.1	-	4.3	0.8	-	0.8	2.4
Articulated Trucks	7	-	7	1	10	-	11	1	-	1	19
% Articulated Trucks	0.1	-	0.1	0.2	0.2	-	0.2	0.0	-	0.0	0.1
Pedestrians	-	410	-	-	-	429	-	-	1161	-	-
% Pedestrians	-	100.0	-	-	-	100.0	-	-	100.0	-	-

Progressive AE
1811 4 Mile Rd NE

Grand Rapids, Michigan, United States 49525
(616) 361-2664

Count Name: Pine St at Front St
Site Code:
Start Date: 05/18/2023

Turning Movement Peak Hour Data (8:00 AM)

05/18/2023	Eastbound St. Eastbound			Westbound St. Westbound				Northbound St. Northbound			
	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Left	Peds	App. Total	Int. Total
8:00 AM	67	0	67	11	41	1	52	9	12	9	128
8:15 AM	78	1	78	10	49	11	59	15	14	15	152
8:30 AM	72	5	72	4	46	4	50	20	9	20	142
8:45 AM	74	9	74	6	39	4	45	23	11	23	142
Total	291	15	291	31	175	20	206	67	46	67	564
Approach %	100.0	-	-	15.0	85.0	-	-	100.0	-	-	-
Total %	51.6	-	51.6	5.5	31.0	-	36.5	11.9	-	11.9	-
PHF	0.933	-	0.933	0.705	0.893	-	0.873	0.728	-	0.728	0.928
Lights	286	-	286	26	165	-	191	64	-	64	541
% Lights	98.3	-	98.3	83.9	94.3	-	92.7	95.5	-	95.5	95.9
Mediums	2	-	2	5	10	-	15	3	-	3	20
% Mediums	0.7	-	0.7	16.1	5.7	-	7.3	4.5	-	4.5	3.5
Articulated Trucks	3	-	3	0	0	-	0	0	-	0	3
% Articulated Trucks	1.0	-	1.0	0.0	0.0	-	0.0	0.0	-	0.0	0.5
Pedestrians	-	15	-	-	-	20	-	-	46	-	-
% Pedestrians	-	100.0	-	-	-	100.0	-	-	100.0	-	-

Turning Movement Peak Hour Data (4:15 PM)

05/18/2023	Eastbound St. Eastbound			Westbound St. Westbound				Northbound St. Northbound			
	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Left	Peds	App. Total	Int. Total
4:15 PM	78	3	78	11	69	2	80	27	10	27	185
4:30 PM	78	0	78	11	64	3	75	29	50	29	182
4:45 PM	83	1	83	3	78	9	81	33	10	33	197
5:00 PM	85	8	85	10	92	21	102	46	28	46	233
Total	324	12	324	35	303	35	338	135	98	135	797
Approach %	100.0	-	-	10.4	89.6	-	-	100.0	-	-	-
Total %	40.7	-	40.7	4.4	38.0	-	42.4	16.9	-	16.9	-
PHF	0.953	-	0.953	0.795	0.823	-	0.828	0.734	-	0.734	0.855
Lights	322	-	322	29	294	-	323	134	-	134	779
% Lights	99.4	-	99.4	82.9	97.0	-	95.6	99.3	-	99.3	97.7
Mediums	2	-	2	6	9	-	15	1	-	1	18
% Mediums	0.6	-	0.6	17.1	3.0	-	4.4	0.7	-	0.7	2.3
Articulated Trucks	0	-	0	0	0	-	0	0	-	0	0
% Articulated Trucks	0.0	-	0.0	0.0	0.0	-	0.0	0.0	-	0.0	0.0
Pedestrians	-	12	-	-	-	35	-	-	98	-	-
% Pedestrians	-	100.0	-	-	-	100.0	-	-	100.0	-	-

Progressive AE
1811 4 Mile Rd NE

Grand Rapids, Michigan, United States 49525
(616) 361-2664

Count Name: Pine St at Front St
Site Code:
Start Date: 05/18/2023

Turning Movement Peak Hour Data (12:15 PM)

05/19/2023	Eastbound St. Eastbound			Westbound St. Westbound				Northbound St. Northbound			
	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Left	Peds	App. Total	Int. Total
12:15 PM	109	9	109	8	94	6	102	40	9	40	251
12:30 PM	112	12	112	12	94	4	106	41	16	41	259
12:45 PM	105	10	105	18	76	5	94	35	11	35	234
1:00 PM	111	12	111	13	72	5	85	42	6	42	238
Total	437	43	437	51	336	20	387	158	42	158	982
Approach %	100.0	-	-	13.2	86.8	-	-	100.0	-	-	-
Total %	44.5	-	44.5	5.2	34.2	-	39.4	16.1	-	16.1	-
PHF	0.975	-	0.975	0.708	0.894	-	0.913	0.940	-	0.940	0.948
Lights	430	-	430	45	320	-	365	157	-	157	952
% Lights	98.4	-	98.4	88.2	95.2	-	94.3	99.4	-	99.4	96.9
Mediums	5	-	5	6	13	-	19	1	-	1	25
% Mediums	1.1	-	1.1	11.8	3.9	-	4.9	0.6	-	0.6	2.5
Articulated Trucks	2	-	2	0	3	-	3	0	-	0	5
% Articulated Trucks	0.5	-	0.5	0.0	0.9	-	0.8	0.0	-	0.0	0.5
Pedestrians	-	43	-	-	-	20	-	-	42	-	-
% Pedestrians	-	100.0	-	-	-	100.0	-	-	100.0	-	-

Turning Movement Peak Hour Data (11:45 AM)

05/20/2023	Eastbound St. Eastbound			Westbound St. Westbound				Northbound St. Northbound			
	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Left	Peds	App. Total	Int. Total
11:45 AM	80	2	80	15	90	7	105	32	22	32	217
12:00 PM	77	14	77	8	80	9	88	31	15	31	196
12:15 PM	76	8	76	4	77	6	81	41	18	41	198
12:30 PM	66	5	66	11	82	7	93	30	25	30	189
Total	299	29	299	38	329	29	367	134	80	134	800
Approach %	100.0	-	-	10.4	89.6	-	-	100.0	-	-	-
Total %	37.4	-	37.4	4.8	41.1	-	45.9	16.8	-	16.8	-
PHF	0.934	-	0.934	0.633	0.914	-	0.874	0.817	-	0.817	0.922
Lights	295	-	295	34	324	-	358	133	-	133	786
% Lights	98.7	-	98.7	89.5	98.5	-	97.5	99.3	-	99.3	98.3
Mediums	4	-	4	4	5	-	9	1	-	1	14
% Mediums	1.3	-	1.3	10.5	1.5	-	2.5	0.7	-	0.7	1.8
Articulated Trucks	0	-	0	0	0	-	0	0	-	0	0
% Articulated Trucks	0.0	-	0.0	0.0	0.0	-	0.0	0.0	-	0.0	0.0
Pedestrians	-	29	-	-	-	29	-	-	80	-	-
% Pedestrians	-	100.0	-	-	-	100.0	-	-	100.0	-	-

Progressive AE
1811 4 Mile Rd NE

Grand Rapids, Michigan, United States 49525
(616) 361-2664

Count Name: Pine St at Front St
Site Code:
Start Date: 07/27/2023

Turning Movement Data

07/27/2023	Front St Eastbound				Front St Westbound				Pine St Northbound			
	Left	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Left	Peds	App. Total	Int. Total
7:00 AM	0	37	6	37	7	15	4	22	2	1	2	61
7:15 AM	0	43	9	43	5	29	1	34	8	3	8	85
7:30 AM	0	51	14	51	7	25	1	32	11	2	11	94
7:45 AM	1	68	14	69	12	38	8	50	16	5	16	135
Hourly Total	1	199	43	200	31	107	14	138	37	11	37	375
8:00 AM	0	61	23	61	11	28	0	39	12	3	12	112
8:15 AM	1	51	15	52	5	47	4	52	10	9	10	114
8:30 AM	0	75	12	75	9	49	1	58	21	4	21	154
8:45 AM	0	78	12	78	10	49	1	59	13	4	13	150
Hourly Total	1	265	62	266	35	173	6	208	56	20	56	530
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-
4:00 PM	0	93	4	93	16	86	14	102	21	25	21	216
4:15 PM	0	75	4	75	9	77	7	86	28	19	28	189
4:30 PM	0	89	10	89	7	61	8	68	34	13	34	191
4:45 PM	0	80	11	80	10	60	6	70	38	17	38	188
Hourly Total	0	337	29	337	42	284	35	326	121	74	121	784
5:00 PM	0	74	7	74	13	87	2	100	52	19	52	226
5:15 PM	0	87	8	87	8	84	5	92	48	10	48	227
5:30 PM	0	73	25	73	7	61	11	68	36	14	36	177
5:45 PM	0	72	10	72	8	63	6	71	36	23	36	179
Hourly Total	0	306	50	306	36	295	24	331	172	66	172	809
07/28/2023	-	-	-	-	-	-	-	-	-	-	-	-
11:00 AM	0	92	10	92	22	70	6	92	42	25	42	226
11:15 AM	1	98	7	99	12	78	2	90	31	8	31	220
11:30 AM	0	109	14	109	5	87	3	92	39	17	39	240
11:45 AM	0	95	15	95	5	86	2	91	42	26	42	228
Hourly Total	1	394	46	395	44	321	13	365	154	76	154	914
12:00 PM	0	102	16	102	16	78	6	94	36	9	36	232
12:15 PM	0	88	6	88	10	108	10	118	39	19	39	245
12:30 PM	0	97	17	97	6	97	7	103	34	12	34	234
12:45 PM	1	98	10	99	9	99	7	108	21	22	21	228
Hourly Total	1	385	49	386	41	382	30	423	130	62	130	939
1:00 PM	0	87	15	87	13	80	10	93	30	15	30	210
1:15 PM	1	83	8	84	11	85	4	96	33	26	33	213
1:30 PM	0	101	11	101	17	90	1	107	30	27	30	238
1:45 PM	0	88	8	88	13	62	2	75	39	16	39	202
Hourly Total	1	359	42	360	54	317	17	371	132	84	132	863
2:00 PM	0	74	2	74	8	55	4	63	30	24	30	167
2:15 PM	0	97	5	97	8	65	13	73	29	17	29	199
2:30 PM	0	74	12	74	8	71	2	79	30	15	30	183
2:45 PM	0	74	12	74	10	80	12	90	42	24	42	206
Hourly Total	0	319	31	319	34	271	31	305	131	80	131	755
3:00 PM	0	95	8	95	7	72	2	79	38	6	38	212
3:15 PM	0	79	5	79	8	88	2	96	47	4	47	222
3:30 PM	0	88	6	88	6	87	15	93	34	13	34	215
3:45 PM	0	73	4	73	7	79	1	86	36	16	36	195
Hourly Total	0	335	23	335	28	326	20	354	155	39	155	844
4:00 PM	0	62	19	62	9	75	5	84	25	22	25	171
4:15 PM	0	74	0	74	5	80	5	85	29	6	29	188
4:30 PM	0	68	9	68	15	72	4	87	29	17	29	184
4:45 PM	0	77	2	77	11	73	5	84	34	30	34	195
Hourly Total	0	281	30	281	40	300	19	340	117	75	117	738
5:00 PM	0	57	3	57	7	67	8	74	38	13	38	169
5:15 PM	0	55	0	55	6	79	11	85	24	8	24	164
5:30 PM	0	62	9	62	2	57	8	59	28	19	28	149
5:45 PM	0	59	10	59	3	67	4	70	27	26	27	156
Hourly Total	0	233	22	233	18	270	31	288	117	66	117	638
07/29/2023	-	-	-	-	-	-	-	-	-	-	-	-
11:00 AM	0	77	9	77	17	82	17	99	32	27	32	208
11:15 AM	0	81	13	81	14	91	13	105	27	50	27	213
11:30 AM	0	64	16	64	5	73	5	78	26	20	26	168

11:45 AM	0	75	14	75	8	82	5	90	35	35	35	200
Hourly Total	0	297	52	297	44	328	40	372	120	132	120	789
12:00 PM	0	68	12	68	7	64	3	71	24	16	24	163
12:15 PM	0	60	13	60	10	80	1	90	28	24	28	178
12:30 PM	0	63	8	63	9	70	8	79	33	26	33	175
12:45 PM	0	74	9	74	6	64	4	70	31	28	31	175
Hourly Total	0	265	42	265	32	278	16	310	116	94	116	691
1:00 PM	0	53	17	53	8	70	16	78	32	28	32	163
1:15 PM	0	61	14	61	9	74	5	83	21	22	21	165
1:30 PM	0	63	5	63	8	59	9	67	21	39	21	151
1:45 PM	0	65	3	65	6	60	11	66	24	44	24	155
Hourly Total	0	242	39	242	31	263	41	294	98	133	98	634
2:00 PM	0	48	6	48	9	62	10	71	34	45	34	153
2:15 PM	0	52	10	52	9	72	16	81	21	24	21	154
2:30 PM	0	60	7	60	13	87	3	100	28	7	28	188
2:45 PM	0	64	7	64	5	63	4	68	23	17	23	155
Hourly Total	0	224	30	224	36	284	33	320	106	93	106	650
3:00 PM	0	57	6	57	7	55	1	62	29	19	29	148
3:15 PM	0	68	11	68	3	59	9	62	24	23	24	154
3:30 PM	0	63	5	63	7	69	6	76	19	19	19	158
3:45 PM	0	48	21	48	4	66	5	70	20	47	20	138
Hourly Total	0	236	43	236	21	249	21	270	92	108	92	598
4:00 PM	0	56	22	56	6	63	3	69	24	34	24	149
4:15 PM	0	52	10	52	5	57	1	62	21	23	21	135
4:30 PM	0	49	9	49	3	67	4	70	24	9	24	143
4:45 PM	0	68	0	68	5	61	6	66	23	23	23	157
Hourly Total	0	225	41	225	19	248	14	267	92	89	92	584
5:00 PM	0	40	7	40	2	47	0	49	20	27	20	109
5:15 PM	0	41	1	41	2	52	3	54	16	22	16	111
5:30 PM	0	70	8	70	9	47	11	56	22	22	22	148
5:45 PM	0	69	16	69	8	57	16	65	16	47	16	150
Hourly Total	0	220	32	220	21	203	30	224	74	118	74	518
Grand Total	5	5122	706	5127	607	4899	435	5506	2020	1420	2020	12653
Approach %	0.1	99.9	-	-	11.0	89.0	-	-	100.0	-	-	-
Total %	0.0	40.5	-	40.5	4.8	38.7	-	43.5	16.0	-	16.0	-
Lights	4	5049	-	5053	514	4734	-	5248	1998	-	1998	12299
% Lights	80.0	98.6	-	98.6	84.7	96.6	-	95.3	98.9	-	98.9	97.2
Mediums	1	66	-	67	93	157	-	250	22	-	22	339
% Mediums	20.0	1.3	-	1.3	15.3	3.2	-	4.5	1.1	-	1.1	2.7
Articulated Trucks	0	7	-	7	0	8	-	8	0	-	0	15
% Articulated Trucks	0.0	0.1	-	0.1	0.0	0.2	-	0.1	0.0	-	0.0	0.1
Pedestrians	-	-	706	-	-	-	435	-	-	1420	-	-
% Pedestrians	-	-	100.0	-	-	-	100.0	-	-	100.0	-	-

Progressive AE
1811 4 Mile Rd NE

Grand Rapids, Michigan, United States 49525
(616) 361-2664

Count Name: Pine St at Front St
Site Code:
Start Date: 07/27/2023

Turning Movement Peak Hour Data (8:00 AM)

07/27/2023	Front St Eastbound				Front St Westbound				Pine St Northbound			
	Left	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Left	Peds	App. Total	Int. Total
8:00 AM	0	61	23	61	11	28	0	39	12	3	12	112
8:15 AM	1	51	15	52	5	47	4	52	10	9	10	114
8:30 AM	0	75	12	75	9	49	1	58	21	4	21	154
8:45 AM	0	78	12	78	10	49	1	59	13	4	13	150
Total	1	265	62	266	35	173	6	208	56	20	56	530
Approach %	0.4	99.6	-	-	16.8	83.2	-	-	100.0	-	-	-
Total %	0.2	50.0	-	50.2	6.6	32.6	-	39.2	10.6	-	10.6	-
PHF	0.250	0.849	-	0.853	0.795	0.883	-	0.881	0.667	-	0.667	0.860
Lights	1	260	-	261	28	156	-	184	54	-	54	499
% Lights	100.0	98.1	-	98.1	80.0	90.2	-	88.5	96.4	-	96.4	94.2
Mediums	0	4	-	4	7	15	-	22	2	-	2	28
% Mediums	0.0	1.5	-	1.5	20.0	8.7	-	10.6	3.6	-	3.6	5.3
Articulated Trucks	0	1	-	1	0	2	-	2	0	-	0	3
% Articulated Trucks	0.0	0.4	-	0.4	0.0	1.2	-	1.0	0.0	-	0.0	0.6
Pedestrians	-	-	62	-	-	-	6	-	-	20	-	-
% Pedestrians	-	-	100.0	-	-	-	100.0	-	-	100.0	-	-

Progressive AE
1811 4 Mile Rd NE

Grand Rapids, Michigan, United States 49525
(616) 361-2664

Count Name: Pine St at Front St
Site Code:
Start Date: 07/27/2023

Turning Movement Peak Hour Data (4:30 PM)

07/27/2023	Front St Eastbound				Front St Westbound				Pine St Northbound			
	Left	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Left	Peds	App. Total	Int. Total
4:30 PM	0	89	10	89	7	61	8	68	34	13	34	191
4:45 PM	0	80	11	80	10	60	6	70	38	17	38	188
5:00 PM	0	74	7	74	13	87	2	100	52	19	52	226
5:15 PM	0	87	8	87	8	84	5	92	48	10	48	227
Total	0	330	36	330	38	292	21	330	172	59	172	832
Approach %	0.0	100.0	-	-	11.5	88.5	-	-	100.0	-	-	-
Total %	0.0	39.7	-	39.7	4.6	35.1	-	39.7	20.7	-	20.7	-
PHF	0.000	0.927	-	0.927	0.731	0.839	-	0.825	0.827	-	0.827	0.916
Lights	0	328	-	328	32	282	-	314	171	-	171	813
% Lights	-	99.4	-	99.4	84.2	96.6	-	95.2	99.4	-	99.4	97.7
Mediums	0	2	-	2	6	10	-	16	1	-	1	19
% Mediums	-	0.6	-	0.6	15.8	3.4	-	4.8	0.6	-	0.6	2.3
Articulated Trucks	0	0	-	0	0	0	-	0	0	-	0	0
% Articulated Trucks	-	0.0	-	0.0	0.0	0.0	-	0.0	0.0	-	0.0	0.0
Pedestrians	-	-	36	-	-	-	21	-	-	59	-	-
% Pedestrians	-	-	100.0	-	-	-	100.0	-	-	100.0	-	-

Progressive AE
1811 4 Mile Rd NE

Grand Rapids, Michigan, United States 49525
(616) 361-2664

Count Name: Pine St at Front St
Site Code:
Start Date: 07/27/2023

Turning Movement Peak Hour Data (11:30 AM)

07/28/2023	Front St Eastbound				Front St Westbound				Pine St Northbound			
	Left	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Left	Peds	App. Total	Int. Total
11:30 AM	0	109	14	109	5	87	3	92	39	17	39	240
11:45 AM	0	95	15	95	5	86	2	91	42	26	42	228
12:00 PM	0	102	16	102	16	78	6	94	36	9	36	232
12:15 PM	0	88	6	88	10	108	10	118	39	19	39	245
Total	0	394	51	394	36	359	21	395	156	71	156	945
Approach %	0.0	100.0	-	-	9.1	90.9	-	-	100.0	-	-	-
Total %	0.0	41.7	-	41.7	3.8	38.0	-	41.8	16.5	-	16.5	-
PHF	0.000	0.904	-	0.904	0.563	0.831	-	0.837	0.929	-	0.929	0.964
Lights	0	385	-	385	30	346	-	376	152	-	152	913
% Lights	-	97.7	-	97.7	83.3	96.4	-	95.2	97.4	-	97.4	96.6
Mediums	0	9	-	9	6	12	-	18	4	-	4	31
% Mediums	-	2.3	-	2.3	16.7	3.3	-	4.6	2.6	-	2.6	3.3
Articulated Trucks	0	0	-	0	0	1	-	1	0	-	0	1
% Articulated Trucks	-	0.0	-	0.0	0.0	0.3	-	0.3	0.0	-	0.0	0.1
Pedestrians	-	-	51	-	-	-	21	-	-	71	-	-
% Pedestrians	-	-	100.0	-	-	-	100.0	-	-	100.0	-	-

Progressive AE
1811 4 Mile Rd NE

Grand Rapids, Michigan, United States 49525
(616) 361-2664

Count Name: Pine St at Front St
Site Code:
Start Date: 07/27/2023

Turning Movement Peak Hour Data (11:00 AM)

07/29/2023	Front St Eastbound				Front St Westbound				Pine St Northbound			
	Left	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Left	Peds	App. Total	Int. Total
11:00 AM	0	77	9	77	17	82	17	99	32	27	32	208
11:15 AM	0	81	13	81	14	91	13	105	27	50	27	213
11:30 AM	0	64	16	64	5	73	5	78	26	20	26	168
11:45 AM	0	75	14	75	8	82	5	90	35	35	35	200
Total	0	297	52	297	44	328	40	372	120	132	120	789
Approach %	0.0	100.0	-	-	11.8	88.2	-	-	100.0	-	-	-
Total %	0.0	37.6	-	37.6	5.6	41.6	-	47.1	15.2	-	15.2	-
PHF	0.000	0.917	-	0.917	0.647	0.901	-	0.886	0.857	-	0.857	0.926
Lights	0	296	-	296	40	323	-	363	120	-	120	779
% Lights	-	99.7	-	99.7	90.9	98.5	-	97.6	100.0	-	100.0	98.7
Mediums	0	0	-	0	4	5	-	9	0	-	0	9
% Mediums	-	0.0	-	0.0	9.1	1.5	-	2.4	0.0	-	0.0	1.1
Articulated Trucks	0	1	-	1	0	0	-	0	0	-	0	1
% Articulated Trucks	-	0.3	-	0.3	0.0	0.0	-	0.0	0.0	-	0.0	0.1
Pedestrians	-	-	52	-	-	-	40	-	-	132	-	-
% Pedestrians	-	-	100.0	-	-	-	100.0	-	-	100.0	-	-

Alley at Pine Street - TMC

Thu Aug 24, 2023
Full Length (7 AM-9 AM, 4 PM-6 PM)
All Classes (Lights and Motorcycles, Heavy, Pedestrians, Bicycles on Crosswalk)
All Movements
ID: 1105311, Location: 44.76348, -85.626094

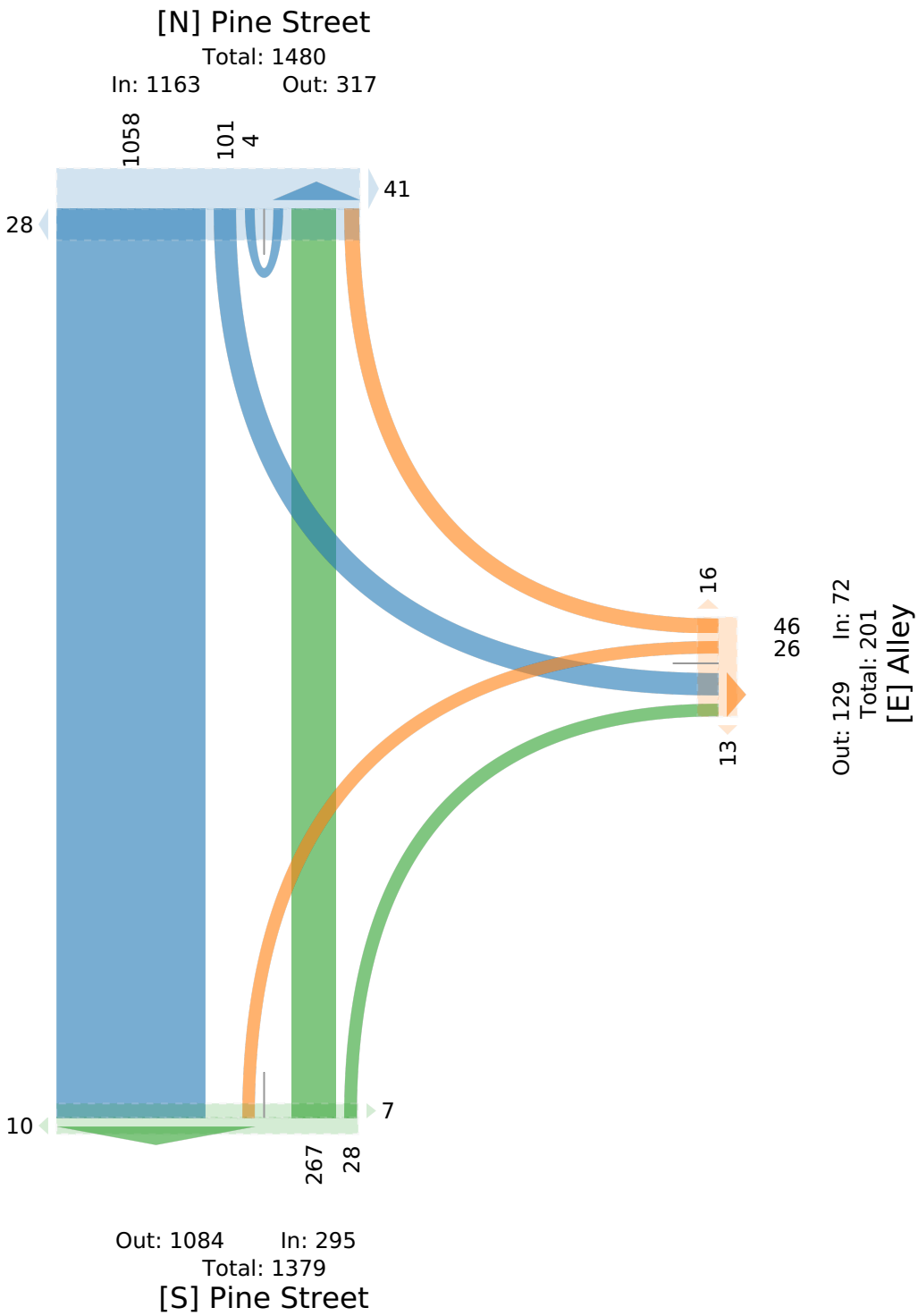
Provided by: Fishbeck-Main Account
1515 Arboretum Drive SE,
Grand Rapids, MI, 49546, US

Leg	Alley					Pine Street					Pine Street					
Direction	Westbound					Northbound					Southbound					
Time	L	R	U	**App**	Ped*	T	R	U	**App**	Ped*	L	T	U	**App**	Ped*	**Int**
2023-08-24 7:00AM	1	0	0	**1**	1	4	1	0	**5**	0	11	37	0	**48**	0	**54**
7:15AM	0	0	0	**0**	2	7	2	0	**9**	2	10	28	1	**39**	1	**48**
7:30AM	1	2	0	**3**	1	10	6	0	**16**	1	9	39	0	**48**	6	**67**
7:45AM	1	1	0	**2**	2	12	8	0	**20**	3	10	51	0	**61**	11	**83**
Hourly Total	3	3	0	**6**	6	33	17	0	**50**	6	40	155	1	**196**	18	**252**
8:00AM	1	2	0	**3**	0	7	2	0	**9**	3	7	55	0	**62**	0	**74**
8:15AM	0	0	0	**0**	0	11	1	0	**12**	0	12	55	0	**67**	0	**79**
8:30AM	0	1	0	**1**	3	11	1	0	**12**	0	10	59	1	**70**	0	**83**
8:45AM	1	2	0	**3**	3	10	2	0	**12**	1	5	66	1	**72**	1	**87**
Hourly Total	2	5	0	**7**	6	39	6	0	**45**	4	34	235	2	**271**	1	**323**
4:00PM	2	6	0	**8**	3	30	1	0	**31**	3	4	76	0	**80**	11	**119**
4:15PM	1	2	0	**3**	0	25	0	0	**25**	0	0	83	0	**83**	5	**111**
4:30PM	6	7	0	**13**	0	18	1	0	**19**	1	2	105	0	**107**	6	**139**
4:45PM	3	2	0	**5**	0	18	1	0	**19**	1	4	82	0	**86**	4	**110**
Hourly Total	12	17	0	**29**	3	91	3	0	**94**	5	10	346	0	**356**	26	**479**
5:00PM	5	7	0	**12**	5	29	0	0	**29**	1	5	89	0	**94**	14	**135**
5:15PM	4	6	0	**10**	4	31	0	0	**31**	0	6	85	0	**91**	0	**132**
5:30PM	0	4	0	**4**	2	29	1	0	**30**	0	3	74	1	**78**	5	**112**
5:45PM	0	4	0	**4**	3	15	1	0	**16**	1	3	74	0	**77**	5	**97**
Hourly Total	9	21	0	**30**	14	104	2	0	**106**	2	17	322	1	**340**	24	**476**
Total	26	46	0	**72**	29	267	28	0	**295**	17	101	1058	4	**1163**	69	**1530**
% Approach	36.1%	63.9%	0%	**-**	-	90.5%	9.5%	0%	**-**	-	8.7%	91.0%	0.3%	**-**	-	**-**
% Total	1.7%	3.0%	0%	**4.7%**	-	17.5%	1.8%	0%	**19.3%**	-	6.6%	69.2%	0.3%	**76.0%**	-	**-**
Lights and Motorcycles	26	44	0	**70**	-	261	28	0	**289**	-	98	1016	4	**1118**	-	1477
% Lights and Motorcycles	100%	95.7%	0%	**97.2%**	-	97.8%	100%	0%	**98.0%**	-	97.0%	96.0%	100%	**96.1%**	-	96.5%
Heavy	0	2	0	**2**	-	6	0	0	**6**	-	3	42	0	**45**	-	53
% Heavy	0%	4.3%	0%	**2.8%**	-	2.2%	0%	0%	**2.0%**	-	3.0%	4.0%	0%	**3.9%**	-	3.5%
Pedestrians	-	-	-	-	27	-	-	-	-	17	-	-	-	-	69	
% Pedestrians	-	-	-	-	93.1%	-	-	-	-	100%	-	-	-	-	100%	-
Bicycles on Crosswalk	-	-	-	-	2	-	-	-	-	0	-	-	-	-	0	
% Bicycles on Crosswalk	-	-	-	-	6.9%	-	-	-	-	0%	-	-	-	-	0%	-

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

Alley at Pine Street - TMC
Thu Aug 24, 2023
Full Length (7 AM-9 AM, 4 PM-6 PM)
All Classes (Lights and Motorcycles, Heavy, Pedestrians, Bicycles on Crosswalk)
All Movements
ID: 1105311, Location: 44.76348, -85.626094

Provided by: Fishbeck-Main Account
1515 Arboretum Drive SE,
Grand Rapids, MI, 49546, US



Alley at Pine Street - TMC

Thu Aug 24, 2023
AM Peak (8 AM - 9 AM)
All Classes (Lights and Motorcycles, Heavy, Pedestrians, Bicycles on Crosswalk)
All Movements
ID: 1105311, Location: 44.76348, -85.626094

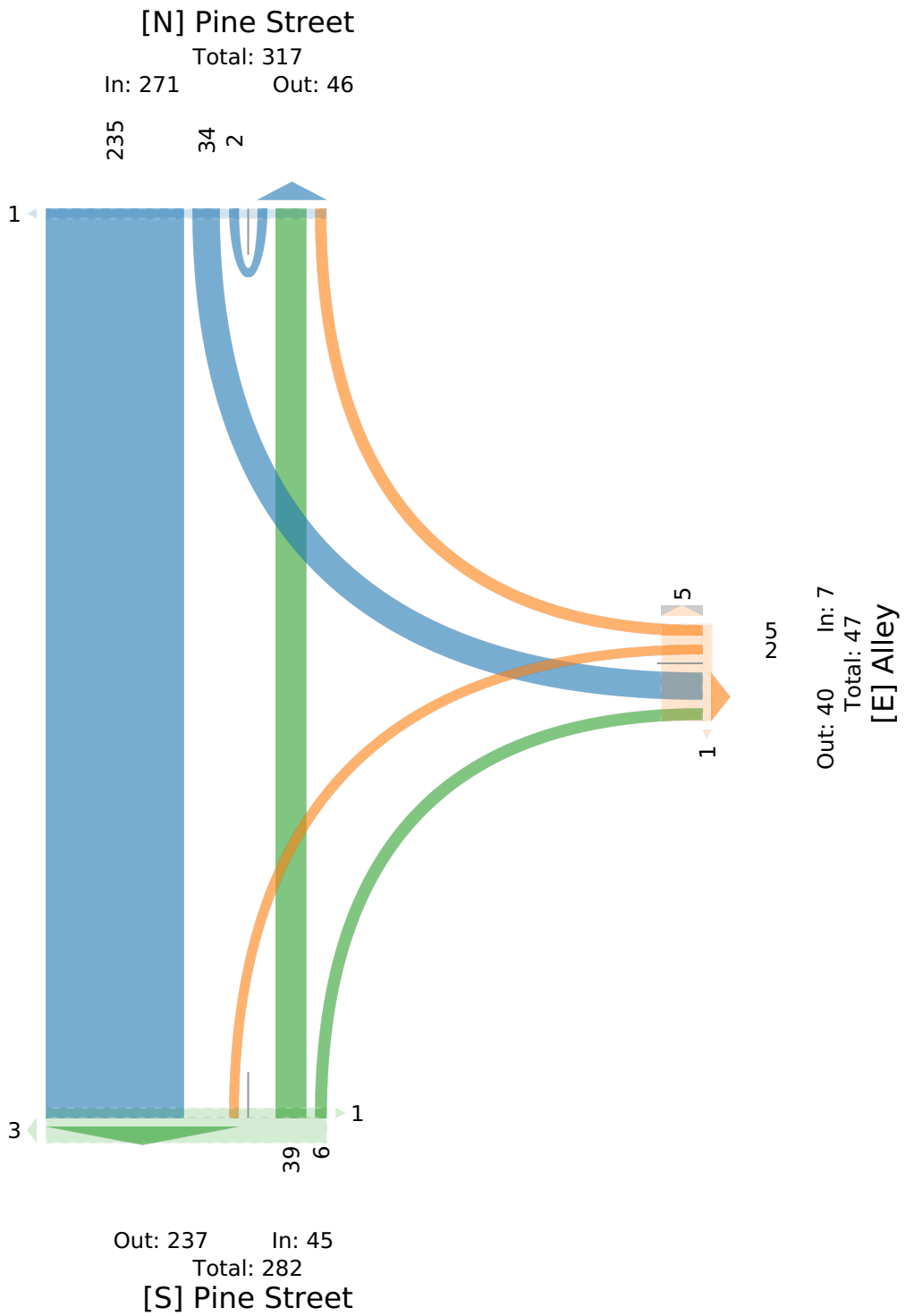
Provided by: Fishbeck-Main Account
1515 Arboretum Drive SE,
Grand Rapids, MI, 49546, US

Leg Direction	Alley Westbound					Pine Street Northbound					Pine Street Southbound					
Time	L	R	U	**App**	Ped*	T	R	U	**App**	Ped*	L	T	U	**App**	Ped*	**Int**
2023-08-24 8:00AM	1	2	0	**3**	0	7	2	0	**9**	3	7	55	0	**62**	0	**74**
8:15AM	0	0	0	**0**	0	11	1	0	**12**	0	12	55	0	**67**	0	**79**
8:30AM	0	1	0	**1**	3	11	1	0	**12**	0	10	59	1	**70**	0	**83**
8:45AM	1	2	0	**3**	3	10	2	0	**12**	1	5	66	1	**72**	1	**87**
Total	2	5	0	**7**	6	39	6	0	**45**	4	34	235	2	**271**	1	**323**
% Approach	28.6%	71.4%	0%	**-**	-	86.7%	13.3%	0%	**-**	-	12.5%	86.7%	0.7%	**-**	-	**-**
% Total	0.6%	1.5%	0%	**2.2%**	-	12.1%	1.9%	0%	**13.9%**	-	10.5%	72.8%	0.6%	**83.9%**	-	**-**
PHF	0.500	0.625	-	**0.583**	-	0.886	0.750	-	**0.938**	-	0.708	0.890	0.500	**0.941**	-	0.928
Lights and Motorcycles	2	3	0	**5**	-	37	6	0	**43**	-	33	227	2	**262**	-	310
% Lights and Motorcycles	100%	60.0%	0%	**71.4%**	-	94.9%	100%	0%	**95.6%**	-	97.1%	96.6%	100%	**96.7%**	-	96.0%
Heavy	0	2	0	**2**	-	2	0	0	**2**	-	1	8	0	**9**	-	13
% Heavy	0%	40.0%	0%	**28.6%**	-	5.1%	0%	0%	**4.4%**	-	2.9%	3.4%	0%	**3.3%**	-	4.0%
Pedestrians	-	-	-	-	6	-	-	-	-	4	-	-	-	-	1	
% Pedestrians	-	-	-	-	100%	-	-	-	-	100%	-	-	-	-	100%	-
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	
% Bicycles on Crosswalk	-	-	-	-	0%	-	-	-	-	0%	-	-	-	-	0%	-

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

Alley at Pine Street - TMC
Thu Aug 24, 2023
AM Peak (8 AM - 9 AM)
All Classes (Lights and Motorcycles, Heavy, Pedestrians, Bicycles on Crosswalk)
All Movements
ID: 1105311, Location: 44.76348, -85.626094

Provided by: Fishbeck-Main Account
1515 Arboretum Drive SE,
Grand Rapids, MI, 49546, US



Alley at Pine Street - TMC

Thu Aug 24, 2023
PM Peak (4:30 PM - 5:30 PM) - Overall Peak Hour
All Classes (Lights and Motorcycles, Heavy, Pedestrians, Bicycles on Crosswalk)
All Movements
ID: 1105311, Location: 44.76348, -85.626094

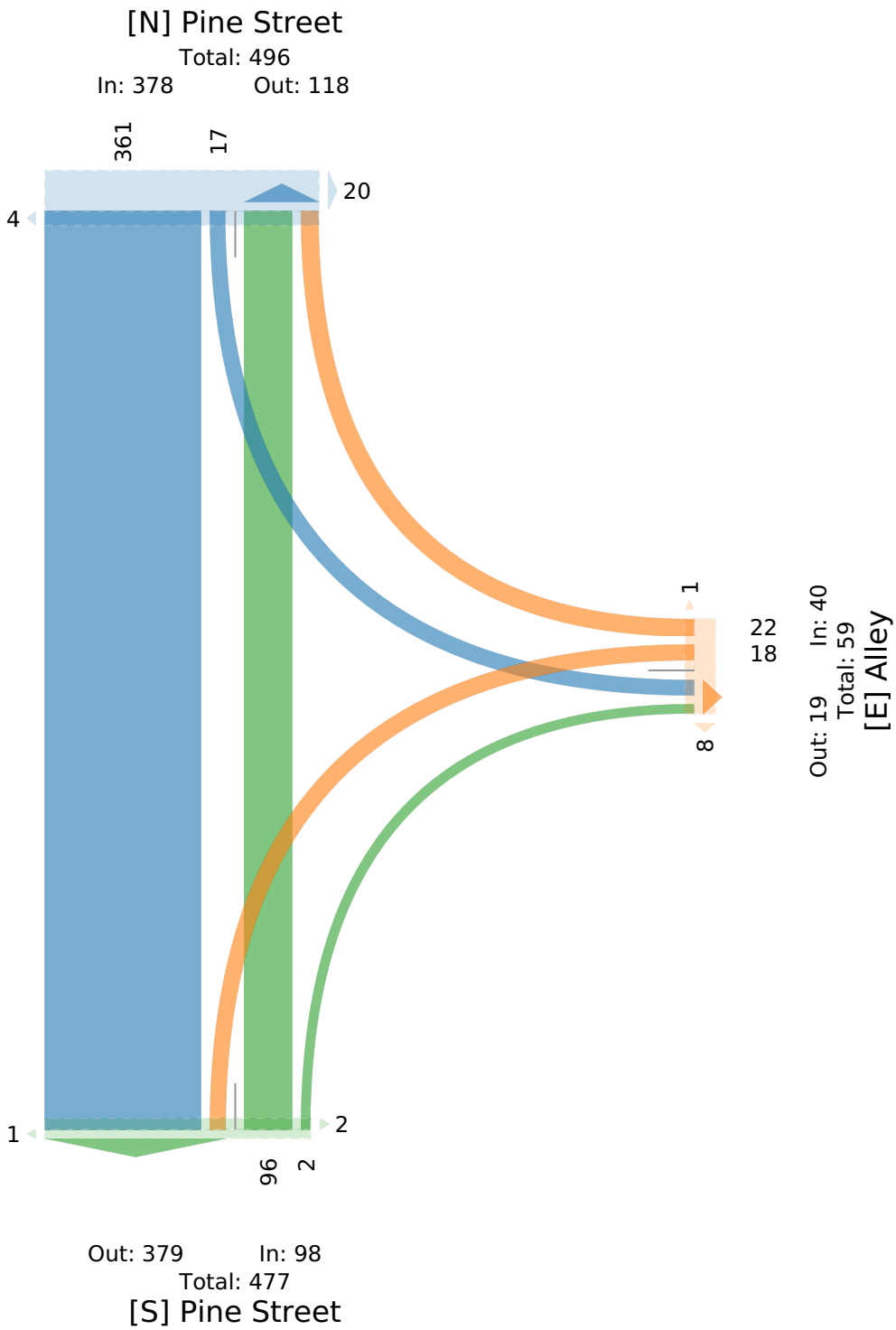
Provided by: Fishbeck-Main Account
1515 Arboretum Drive SE,
Grand Rapids, MI, 49546, US

Leg / Direction	Alley Westbound					Pine Street Northbound					Pine Street Southbound					
Time	L	R	U	**App**	Ped*	T	R	U	**App**	Ped*	L	T	U	**App**	Ped*	**Int**
2023-08-24 4:30PM	6	7	0	**13**	0	18	1	0	**19**	1	2	105	0	**107**	6	**139**
4:45PM	3	2	0	**5**	0	18	1	0	**19**	1	4	82	0	**86**	4	**110**
5:00PM	5	7	0	**12**	5	29	0	0	**29**	1	5	89	0	**94**	14	**135**
5:15PM	4	6	0	**10**	4	31	0	0	**31**	0	6	85	0	**91**	0	**132**
Total	18	22	0	**40**	9	96	2	0	**98**	3	17	361	0	**378**	24	**516**
% Approach	45.0%	55.0%	0%	**-**	-	98.0%	2.0%	0%	**-**	-	4.5%	95.5%	0%	**-**	-	-
% Total	3.5%	4.3%	0%	**7.8%**	-	18.6%	0.4%	0%	**19.0%**	-	3.3%	70.0%	0%	**73.3%**	-	-
PHF	0.750	0.786	-	**0.769**	-	0.774	0.500	-	**0.790**	-	0.708	0.860	-	**0.883**	-	0.928
Lights and Motorcycles	18	22	0	**40**	-	95	2	0	**97**	-	17	349	0	**366**	-	503
% Lights and Motorcycles	100%	100%	0%	**100%**	-	99.0%	100%	0%	**99.0%**	-	100%	96.7%	0%	**96.8%**	-	97.5%
Heavy	0	0	0	**0**	-	1	0	0	**1**	-	0	12	0	**12**	-	13
% Heavy	0%	0%	0%	**0%**	-	1.0%	0%	0%	**1.0%**	-	0%	3.3%	0%	**3.2%**	-	2.5%
Pedestrians	-	-	-	-	9	-	-	-	-	3	-	-	-	-	24	
% Pedestrians	-	-	-	-	100%	-	-	-	-	100%	-	-	-	-	100%	-
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	
% Bicycles on Crosswalk	-	-	-	-	0%	-	-	-	-	0%	-	-	-	-	0%	-

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

Alley at Pine Street - TMC
Thu Aug 24, 2023
PM Peak (4:30 PM - 5:30 PM) - Overall Peak Hour
All Classes (Lights and Motorcycles, Heavy, Pedestrians, Bicycles on Crosswalk)
All Movements
ID: 1105311, Location: 44.76348, -85.626094

Provided by: Fishbeck-Main Account
1515 Arboretum Drive SE,
Grand Rapids, MI, 49546, US



Alley at Union Street - TMC

Thu Aug 24, 2023
Full Length (7 AM-9 AM, 4 PM-6 PM)
All Classes (Lights and Motorcycles, Heavy, Pedestrians, Bicycles on Crosswalk)
All Movements
ID: 1105313, Location: 44.763489, -85.623825

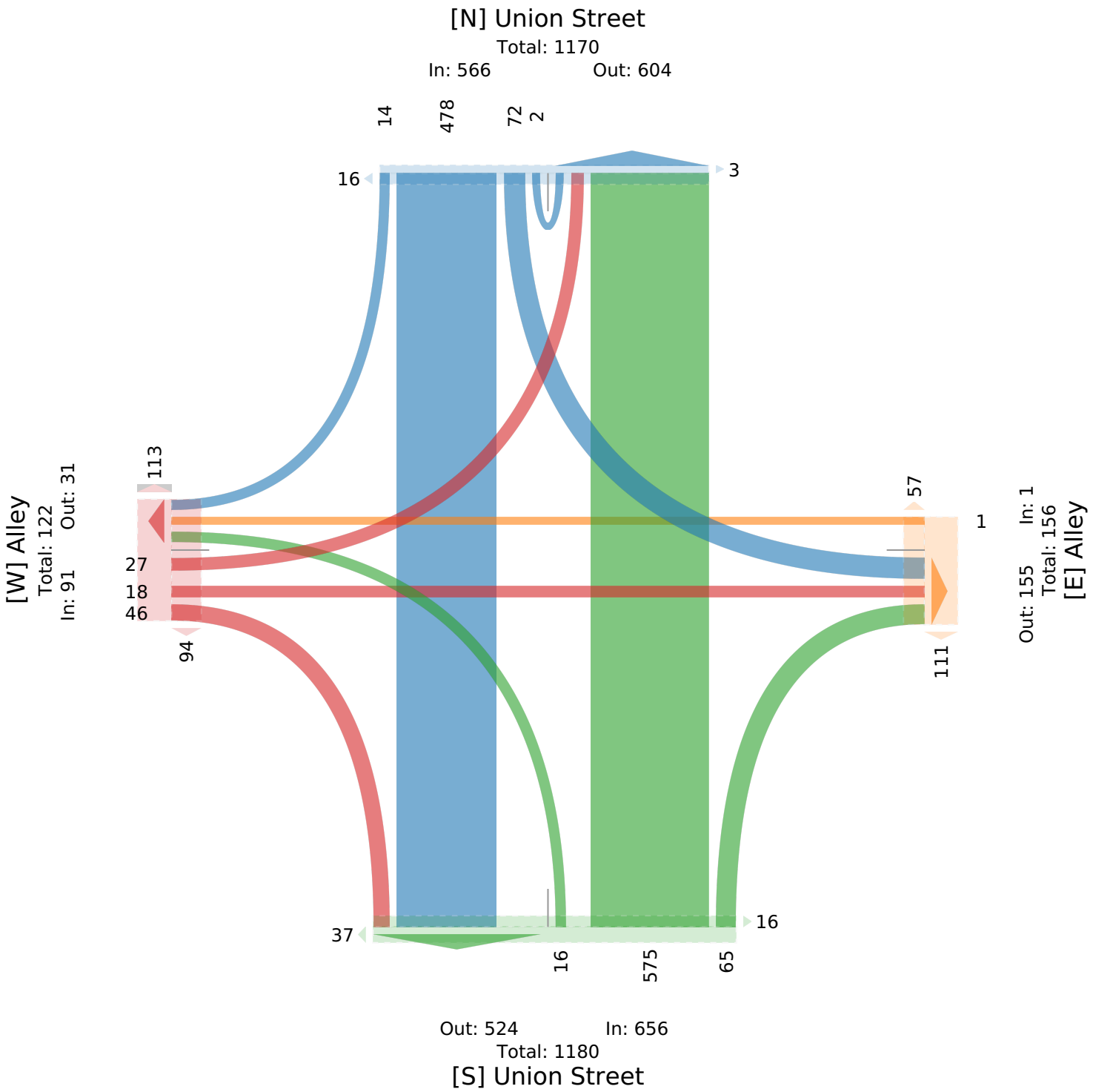
Provided by: Fishbeck-Main Account
1515 Arboretum Drive SE, Grand Rapids, MI, 49546, US

Leg	Alley						Alley						Union Street						Union Street						
Direction	Eastbound						Westbound						Northbound						Southbound						
Time	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	Int
2023-08-24 7:00AM	1	1	0	0	**2**	0	0	0	0	0	**0**	0	1	11	2	0	**14**	0	3	9	1	0	**13**	0	**29**
7:15AM	2	2	0	0	**4**	3	0	0	0	0	**0**	2	1	11	0	0	**12**	0	0	10	1	0	**11**	0	**27**
7:30AM	0	0	0	0	**0**	5	0	0	0	0	**0**	0	2	17	2	0	**21**	0	2	25	1	0	**28**	1	**49**
7:45AM	0	0	2	0	**2**	5	0	0	0	0	**0**	3	2	16	3	0	**21**	2	1	11	1	0	**13**	1	**36**
Hourly Total	3	3	2	0	**8**	13	0	0	0	0	**0**	5	6	55	7	0	**68**	2	6	55	4	0	**65**	2	**141**
8:00AM	1	2	2	0	**5**	0	0	0	0	0	**0**	1	2	28	4	0	**34**	0	2	17	0	0	**19**	1	**58**
8:15AM	4	0	2	0	**6**	8	0	0	0	0	**0**	4	2	35	0	0	**37**	2	2	23	3	0	**28**	0	**71**
8:30AM	4	1	2	0	**7**	5	0	0	0	0	**0**	4	2	24	3	0	**29**	1	3	16	0	0	**19**	0	**55**
8:45AM	0	1	1	0	**2**	2	0	0	0	0	**0**	1	1	37	3	0	**41**	2	4	32	1	0	**37**	4	**80**
Hourly Total	9	4	7	0	**20**	15	0	0	0	0	**0**	10	7	124	10	0	**141**	5	11	88	4	0	**103**	5	**264**
4:00PM	5	0	6	0	**11**	34	0	0	0	0	**0**	18	0	48	5	0	**53**	10	5	34	1	0	**40**	2	**104**
4:15PM	0	0	4	0	**4**	7	0	0	0	0	**0**	25	0	60	5	0	**65**	6	6	32	0	0	**38**	3	**107**
4:30PM	2	2	4	0	**8**	11	0	0	0	0	**0**	14	3	46	5	0	**54**	6	8	46	2	0	**56**	0	**118**
4:45PM	0	4	1	0	**5**	42	0	0	0	0	**0**	14	0	44	15	0	**59**	10	11	46	1	0	**58**	3	**122**
Hourly Total	7	6	15	0	**28**	94	0	0	0	0	**0**	71	3	198	30	0	**231**	32	30	158	4	0	**192**	8	**451**
5:00PM	4	1	10	0	**15**	34	0	0	0	0	**0**	29	0	57	6	0	**63**	4	8	54	0	1	**63**	0	**141**
5:15PM	3	2	4	0	**9**	11	0	0	0	0	**0**	17	0	55	3	0	**58**	1	5	37	2	1	**45**	2	**112**
5:30PM	1	1	4	0	**6**	18	0	1	0	0	**1**	16	0	47	4	0	**51**	5	10	47	0	0	**57**	1	**115**
5:45PM	0	1	4	0	**5**	22	0	0	0	0	**0**	20	0	39	5	0	**44**	4	2	39	0	0	**41**	1	**90**
Hourly Total	8	5	22	0	**35**	85	0	1	0	0	**1**	82	0	198	18	0	**216**	14	25	177	2	2	**206**	4	**458**
Total	27	18	46	0	**91**	207	0	1	0	0	**1**	168	16	575	65	0	**656**	53	72	478	14	2	**566**	19	**1314**
% Approach	29.7%	19.8%	50.5%	0%	**-**	-	0%	100%	0%	0%	**-**	-	2.4%	87.7%	9.9%	0%	**-**	-	12.7%	84.5%	2.5%	0.4%	**-**	-	-
% Total	2.1%	1.4%	3.5%	0%	**6.9%**	-	0%	0.1%	0%	0%	**0.1%**	-	1.2%	43.8%	4.9%	0%	**49.9%**	-	5.5%	36.4%	1.1%	0.2%	**43.1%**	-	-
Lights and Motorcycles	26	17	46	0	**89**	-	0	1	0	0	**1**	-	16	558	60	0	**634**	-	68	468	14	2	**552**	-	1276
% Lights and Motorcycles	96.3%	94.4%	100%	0%	**97.8%**	-	0%	100%	0%	0%	**100%**	-	100%	97.0%	92.3%	0%	**96.6%**	-	94.4%	97.9%	100%	100%	**97.5%**	-	97.1%
Heavy	1	1	0	0	**2**	-	0	0	0	0	**0**	-	0	17	5	0	**22**	-	4	10	0	0	**14**	-	38
% Heavy	3.7%	5.6%	0%	0%	**2.2%**	-	0%	0%	0%	0%	**0%**	-	0%	3.0%	7.7%	0%	**3.4%**	-	5.6%	2.1%	0%	0%	**2.5%**	-	2.9%
Pedestrians	-	-	-	-	-	205	-	-	-	-	-	167	-	-	-	-	-	52	-	-	-	-	-	19	
% Pedestrians	-	-	-	-	-	99.0%	-	-	-	-	-	99.4%	-	-	-	-	-	98.1%	-	-	-	-	-	100%	-
Bicycles on Crosswalk	-	-	-	-	-	2	-	-	-	-	-	1	-	-	-	-	-	1	-	-	-	-	-	0	
% Bicycles on Crosswalk	-	-	-	-	-	1.0%	-	-	-	-	-	0.6%	-	-	-	-	-	1.9%	-	-	-	-	-	0%	-

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

Alley at Union Street - TMC
Thu Aug 24, 2023
Full Length (7 AM-9 AM, 4 PM-6 PM)
All Classes (Lights and Motorcycles, Heavy, Pedestrians, Bicycles on Crosswalk)
All Movements
ID: 1105313, Location: 44.763489, -85.623825

Provided by: Fishbeck-Main Account
1515 Arboretum Drive SE,
Grand Rapids, MI, 49546, US



Alley at Union Street - TMC

Thu Aug 24, 2023
AM Peak (8 AM - 9 AM)
All Classes (Lights and Motorcycles, Heavy, Pedestrians, Bicycles on Crosswalk)
All Movements
ID: 1105313, Location: 44.763489, -85.623825

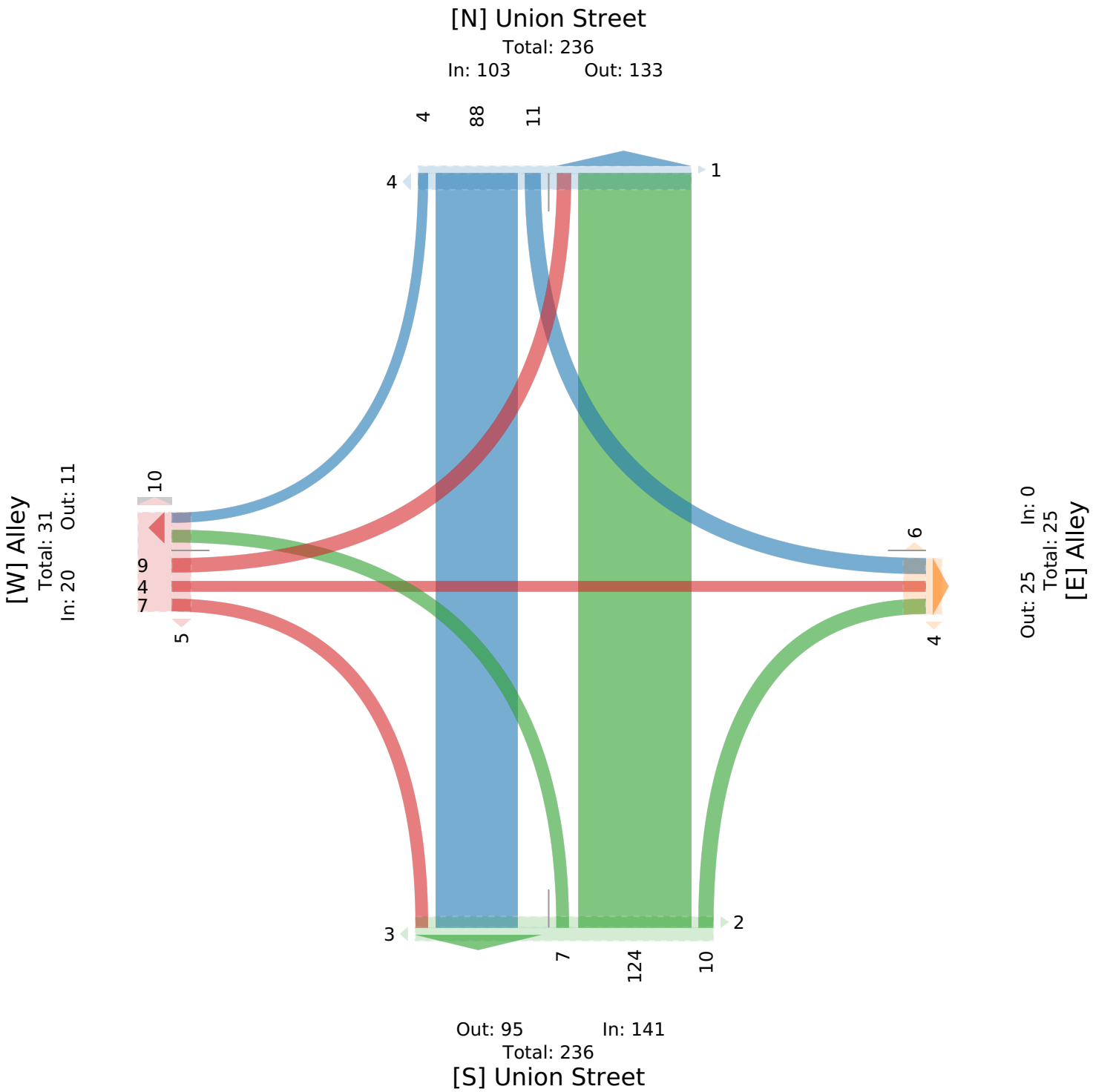
Provided by: Fishbeck-Main Account
1515 Arboretum Drive SE,
Grand Rapids, MI, 49546, US

Leg / Direction	Alley Eastbound						Alley Westbound						Union Street Northbound						Union Street Southbound						
Time	L	T	R	U	**App**	Ped*	L	T	R	U	**App**	Ped*	L	T	R	U	**App**	Ped*	L	T	R	U	**App**	Ped*	**Int**
2023-08-24 8:00AM	1	2	2	0	**5**	0	0	0	0	0	**0**	1	2	28	4	0	**34**	0	2	17	0	0	**19**	1	**58**
8:15AM	4	0	2	0	**6**	8	0	0	0	0	**0**	4	2	35	0	0	**37**	2	2	23	3	0	**28**	0	**71**
8:30AM	4	1	2	0	**7**	5	0	0	0	0	**0**	4	2	24	3	0	**29**	1	3	16	0	0	**19**	0	**55**
8:45AM	0	1	1	0	**2**	2	0	0	0	0	**0**	1	1	37	3	0	**41**	2	4	32	1	0	**37**	4	**80**
Total	9	4	7	0	**20**	15	0	0	0	0	**0**	10	7	124	10	0	**141**	5	11	88	4	0	**103**	5	**264**
% Approach	45.0%	20.0%	35.0%	0%	**-**	-	0%	0%	0%	0%	**-**	-	5.0%	87.9%	7.1%	0%	**-**	-	10.7%	85.4%	3.9%	0%	**-**	-	**-**
% Total	3.4%	1.5%	2.7%	0%	**7.6%**	-	0%	0%	0%	0%	**0%**	-	2.7%	47.0%	3.8%	0%	**53.4%**	-	4.2%	33.3%	1.5%	0%	**39.0%**	-	**-**
PHF	0.563	0.500	0.875		**0.714**	-	-	-	-	-	**-**	-	0.875	0.838	0.625		**0.860**	-	0.688	0.688	0.333		**0.696**	-	0.825
Lights and Motorcycles	9	4	7	0	**20**	-	0	0	0	0	**0**	-	7	121	10	0	**138**	-	11	85	4	0	**100**	-	258
% Lights and Motorcycles	100%	100%	100%	0%	**100%**	-	0%	0%	0%	0%	**-**	-	100%	97.6%	100%	0%	**97.9%**	-	100%	96.6%	100%	0%	**97.1%**	-	97.7%
Heavy	0	0	0	0	**0**	-	0	0	0	0	**0**	-	0	3	0	0	**3**	-	0	3	0	0	**3**	-	6
% Heavy	0%	0%	0%	0%	**0%**	-	0%	0%	0%	0%	**-**	-	0%	2.4%	0%	0%	**2.1%**	-	0%	3.4%	0%	0%	**2.9%**	-	2.3%
Pedestrians	-	-	-	-	-	15	-	-	-	-	-	10	-	-	-	-	-	5	-	-	-	-	-	5	
% Pedestrians	-	-	-	-	-	100%	-	-	-	-	-	100%	-	-	-	-	-	100%	-	-	-	-	-	100%	-
Bicycles on Crosswalk	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	
% Bicycles on Crosswalk	-	-	-	-	-	0%	-	-	-	-	-	0%	-	-	-	-	-	0%	-	-	-	-	-	0%	-

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

Alley at Union Street - TMC
Thu Aug 24, 2023
AM Peak (8 AM - 9 AM)
All Classes (Lights and Motorcycles, Heavy, Pedestrians, Bicycles on Crosswalk)
All Movements
ID: 1105313, Location: 44.763489, -85.623825

Provided by: Fishbeck-Main Account
1515 Arboretum Drive SE,
Grand Rapids, MI, 49546, US



Alley at Union Street - TMC

Thu Aug 24, 2023
PM Peak (4:30 PM - 5:30 PM) - Overall Peak Hour
All Classes (Lights and Motorcycles, Heavy, Pedestrians, Bicycles on Crosswalk)
All Movements
ID: 1105313, Location: 44.763489, -85.623825

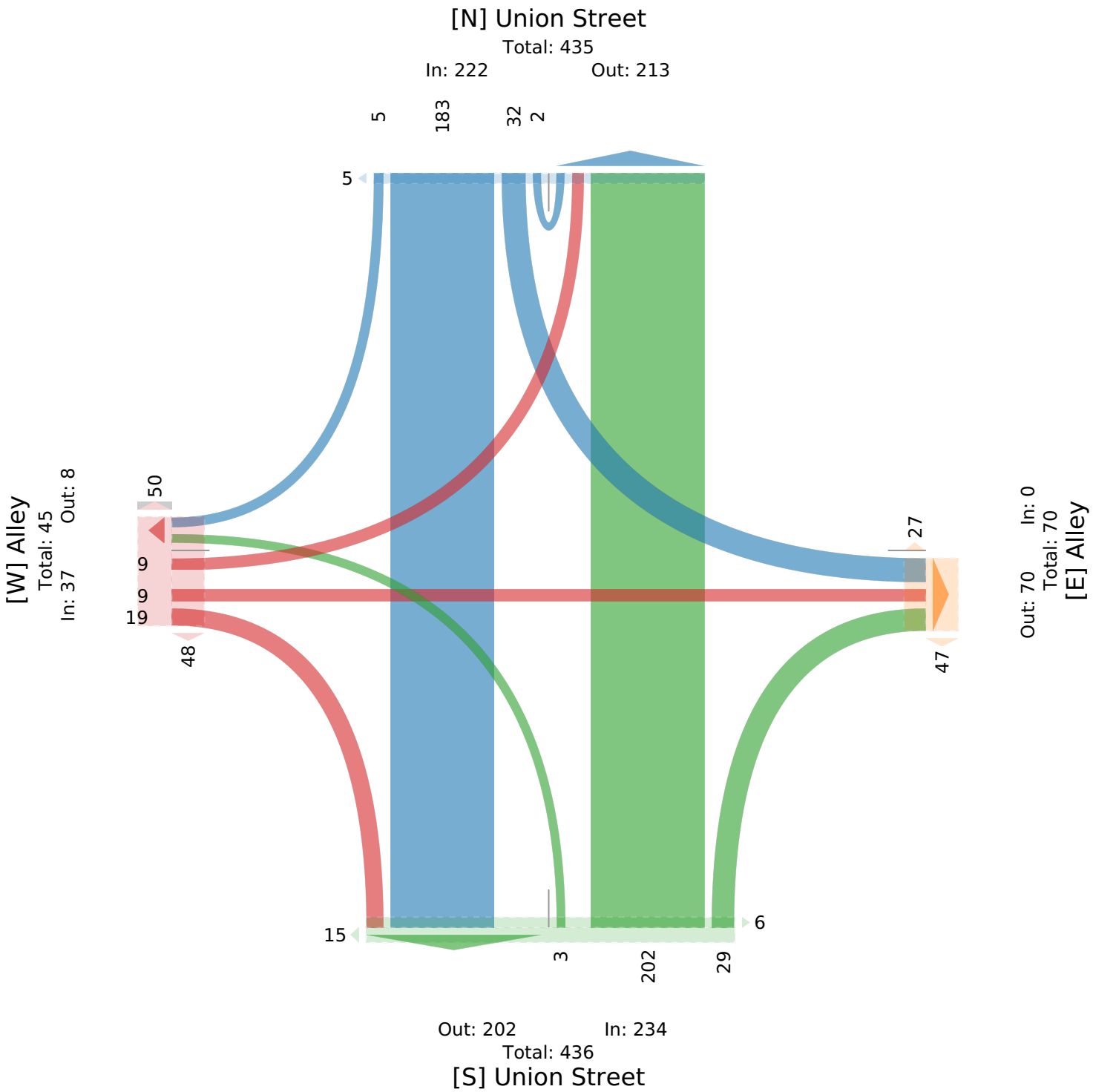
Provided by: Fishbeck-Main Account
1515 Arboretum Drive SE,
Grand Rapids, MI, 49546, US

Leg	Alley						Alley						Union Street						Union Street						
Direction	Eastbound						Westbound						Northbound						Southbound						
Time	L	T	R	U	**App**	Ped*	L	T	R	U	**App**	Ped*	L	T	R	U	**App**	Ped*	L	T	R	U	**App**	Ped*	**Int**
2023-08-24 4:30PM	2	2	4	0	**8**	11	0	0	0	0	**0**	14	3	46	5	0	**54**	6	8	46	2	0	**56**	0	**118**
4:45PM	0	4	1	0	**5**	42	0	0	0	0	**0**	14	0	44	15	0	**59**	10	11	46	1	0	**58**	3	**122**
5:00PM	4	1	10	0	**15**	34	0	0	0	0	**0**	29	0	57	6	0	**63**	4	8	54	0	1	**63**	0	**141**
5:15PM	3	2	4	0	**9**	11	0	0	0	0	**0**	17	0	55	3	0	**58**	1	5	37	2	1	**45**	2	**112**
Total	9	9	19	0	**37**	98	0	0	0	0	**0**	74	3	202	29	0	**234**	21	32	183	5	2	**222**	5	**493**
% Approach	24.3%	24.3%	51.4%	0%	**-**	-	0%	0%	0%	0%	**-**	-	1.3%	86.3%	12.4%	0%	**-**	-	14.4%	82.4%	2.3%	0.9%	**-**	-	**-**
% Total	1.8%	1.8%	3.9%	0%	**7.5%**	-	0%	0%	0%	0%	**0%**	-	0.6%	41.0%	5.9%	0%	**47.5%**	-	6.5%	37.1%	1.0%	0.4%	**45.0%**	-	-
PHF	0.563	0.563	0.475	-	**0.617**	-	-	-	-	-	**-**	-	0.250	0.886	0.483	-	**0.929**	-	0.727	0.847	0.625	0.500	**0.881**	-	0.874
Lights and Motorcycles	9	9	19	0	**37**	-	0	0	0	0	**0**	-	3	197	28	0	**228**	-	32	180	5	2	**219**	-	484
% Lights and Motorcycles	100%	100%	100%	0%	**100%**	-	0%	0%	0%	0%	**-**	-	100%	97.5%	96.6%	0%	**97.4%**	-	100%	98.4%	100%	100%	**98.6%**	-	98.2%
Heavy	0	0	0	0	**0**	-	0	0	0	0	**0**	-	0	5	1	0	**6**	-	0	3	0	0	**3**	-	9
% Heavy	0%	0%	0%	0%	**0%**	-	0%	0%	0%	0%	**-**	-	0%	2.5%	3.4%	0%	**2.6%**	-	0%	1.6%	0%	0%	**1.4%**	-	1.8%
Pedestrians	-	-	-	-	-	97	-	-	-	-	-	74	-	-	-	-	-	20	-	-	-	-	-	5	
% Pedestrians	-	-	-	-	-	99.0%	-	-	-	-	-	100%	-	-	-	-	-	95.2%	-	-	-	-	-	100%	-
Bicycles on Crosswalk	-	-	-	-	-	1	-	-	-	-	-	0	-	-	-	-	-	1	-	-	-	-	-	0	
% Bicycles on Crosswalk	-	-	-	-	-	1.0%	-	-	-	-	-	0%	-	-	-	-	-	4.8%	-	-	-	-	-	0%	-

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

Alley at Union Street - TMC
Thu Aug 24, 2023
PM Peak (4:30 PM - 5:30 PM) - Overall Peak Hour
All Classes (Lights and Motorcycles, Heavy, Pedestrians, Bicycles on Crosswalk)
All Movements
ID: 1105313, Location: 44.763489, -85.623825

Provided by: Fishbeck-Main Account
1515 Arboretum Drive SE,
Grand Rapids, MI, 49546, US



Default Report Title
Use Preferences to Define Titles

Comment 1: Radar Unit #1
Comment 2: S Side of State, Between Pine and Union
Comment 3: Unit Facing NW
Comment 4: Oncoming EB Traffic is Near Side

2/27/2023	Monday		Tuesday		Wednesday		Thursday		Friday		Weekday Average		Saturday		Sunday	
Time	East Bound, 1	West Bound, 2	East Bound, 1	West Bound, 2	East Bound, 1	West Bound, 2	East Bound, 1	West Bound, 2	East Bound, 1	West Bound, 2	East Bound, 1	West Bound, 2	East Bound, 1	West Bound, 2	East Bound, 1	West Bound, 2
12:00 AM	*	*	*	*	*	*	14	4	11	5	12	4	35	14	50	16
1:00	*	*	*	*	*	*	14	2	14	2	14	2	32	8	23	6
2:00	*	*	*	*	*	*	12	3	6	0	9	2	14	4	8	1
3:00	*	*	*	*	*	*	7	0	6	0	6	0	6	1	5	1
4:00	*	*	*	*	*	*	15	2	6	2	10	2	0	0	2	1
5:00	*	*	*	*	*	*	15	4	22	6	18	5	6	1	4	3
6:00	*	*	*	*	*	*	58	13	74	15	66	14	16	8	8	2
7:00	*	*	*	*	*	*	182	35	214	38	198	36	56	10	33	7
8:00	*	*	*	*	*	*	234	41	247	47	240	44	101	30	76	15
9:00	*	*	*	*	*	*	297	52	267	65	282	58	191	27	104	25
10:00	*	*	*	*	*	*	307	77	299	74	303	76	255	66	160	34
11:00	*	*	*	*	*	*	296	82	349	67	322	74	275	94	162	43
12:00 PM	*	*	*	*	*	*	310	97	396	108	353	102	309	99	196	62
1:00	*	*	*	*	*	*	310	99	332	100	321	100	300	94	*	*
2:00	*	*	*	*	*	*	317	94	374	106	346	100	315	74	*	*
3:00	*	*	*	*	*	*	346	99	371	109	358	104	255	74	*	*
4:00	*	*	*	*	323	99	362	100	365	124	350	108	297	75	*	*
5:00	*	*	*	*	323	93	340	95	341	138	335	109	252	91	*	*
6:00	*	*	*	*	216	52	191	58	253	102	220	71	206	78	*	*
7:00	*	*	*	*	140	43	117	54	217	75	158	57	205	43	*	*
8:00	*	*	*	*	82	57	114	46	180	54	125	52	126	55	*	*
9:00	*	*	*	*	68	28	61	32	84	23	71	28	101	53	*	*
10:00	*	*	*	*	36	11	45	16	25	14	35	14	85	24	*	*
11:00	*	*	*	*	16	14	28	9	33	6	26	10	61	32	*	*
Total	0	0	0	0	1204	397	3992	1114	4486	1280	4178	1172	3499	1055	831	216
Day	0		0		1601		5106		5766		5350		4554		1047	
AM Peak							10:00	11:00	11:00	10:00	11:00	10:00	11:00	11:00	11:00	11:00
Volume							307	82	349	74	322	76	275	94	162	43
PM Peak					4:00	4:00	4:00	4:00	12:00 PM	5:00	3:00	5:00	2:00	12:00 PM	12:00 PM	12:00 PM
Volume					323	99	362	100	396	138	358	109	315	99	196	62
Comb Total	0		0		1601		5106		5766		5350		4554		1047	
ADT	ADT: 4,832		AADT: 4,832													

Default Report Title
Use Preferences to Define Titles

Comment 1: Radar Unit 1
Comment 2: S Side of State, Between Pine and Union
Comment 3: Unit Facing NW
Comment 4: Oncoming EB Traffic is Near Side

5/15/2023	Monday		Tuesday		Wednesday		Thursday		Friday		Saturday		Sunday		Week Average	
Time	East Bound, 1	West Bound, 2	East Bound, 1	West Bound, 2	East Bound, 1	West Bound, 2	East Bound, 1	West Bound, 2	East Bound, 1	West Bound, 2	East Bound, 1	West Bound, 2	East Bound, 1	West Bound, 2	East Bound, 1	West Bound, 2
12:00 AM	*	*	*	*	*	*	14	6	19	3	63	13	*	*	32	7
1:00	*	*	*	*	*	*	8	7	13	5	31	14	*	*	17	9
2:00	*	*	*	*	*	*	6	4	8	0	17	13	*	*	10	6
3:00	*	*	*	*	*	*	3	4	3	1	7	2	*	*	4	2
4:00	*	*	*	*	*	*	4	0	5	1	4	1	*	*	4	1
5:00	*	*	*	*	*	*	21	6	19	2	11	1	*	*	17	3
6:00	*	*	*	*	*	*	60	17	60	31	20	4	*	*	47	17
7:00	*	*	*	*	*	*	175	69	181	56	66	13	*	*	141	46
8:00	*	*	*	*	*	*	260	85	230	61	129	24	*	*	206	57
9:00	*	*	*	*	*	*	297	76	289	86	261	63	*	*	282	75
10:00	*	*	*	*	*	*	246	68	279	109	276	72	*	*	267	83
11:00	*	*	*	*	*	*	96	2	343	124	294	113	*	*	244	80
12:00 PM	*	*	*	*	*	*	97	5	333	156	275	142	*	*	235	101
1:00	*	*	*	*	*	*	138	46	314	161	281	145	*	*	244	117
2:00	*	*	*	*	*	*	319	124	328	135	281	110	*	*	309	123
3:00	*	*	*	*	*	*	319	135	275	91	268	103	*	*	287	110
4:00	*	*	*	*	*	*	354	115	314	123	277	89	*	*	315	109
5:00	*	*	*	*	*	*	328	125	278	127	254	65	*	*	287	106
6:00	*	*	*	*	*	*	228	105	266	104	229	92	*	*	241	100
7:00	*	*	*	*	*	*	163	64	243	110	211	72	*	*	206	82
8:00	*	*	*	*	*	*	154	60	208	58	191	57	*	*	184	58
9:00	*	*	*	*	*	*	103	58	167	68	156	54	*	*	142	60
10:00	*	*	*	*	*	*	60	36	117	64	124	42	*	*	100	47
11:00	*	*	*	*	*	*	35	22	68	38	74	34	*	*	59	31
Total	0	0	0	0	0	0	3488	1239	4360	1714	3800	1338	0	0	3880	1430
Day	0		0		0		4727		6074		5138		0		5310	
AM Peak							9:00	8:00	11:00	11:00	11:00	11:00			9:00	10:00
Volume							297	85	343	124	294	113			282	83
PM Peak							4:00	3:00	12:00 PM	1:00	1:00	1:00			4:00	2:00
Volume							354	135	333	161	281	145			315	123
Comb Total	0		0		0		4727		6074		5138		0		5310	
ADT	ADT: 5,313		AADT: 5,313													

Default Report Title
Use Preferences to Define Titles

Comment 1: Radar Unit 1
Comment 2: S. Side of State, Between Pine and Union
Comment 3: Unit Facing NW
Comment 4: Oncoming EB Traffic is Near Side

7/24/2023	Monday		Tuesday		Wednesday		Thursday		Friday		Saturday		Sunday		Week Average	
Time	East Bound, 1	West Bound, 2	East Bound, 1	West Bound, 2	East Bound, 1	West Bound, 2	East Bound, 1	West Bound, 2	East Bound, 1	West Bound, 2	East Bound, 1	West Bound, 2	East Bound, 1	West Bound, 2	East Bound, 1	West Bound, 2
12:00 AM	*	*	*	*	*	*	22	5	24	11	41	19	49	15	34	12
1:00	*	*	*	*	*	*	7	2	11	5	27	9	32	12	19	7
2:00	*	*	*	*	*	*	1	4	4	7	13	12	22	10	10	8
3:00	*	*	*	*	*	*	1	3	3	8	8	2	4	0	4	3
4:00	*	*	*	*	*	*	14	1	14	2	1	2	2	3	8	2
5:00	*	*	*	*	*	*	28	6	15	3	14	2	6	1	16	3
6:00	*	*	*	*	*	*	62	28	70	19	22	7	10	3	41	14
7:00	*	*	*	*	*	*	173	37	147	50	60	24	47	15	107	32
8:00	*	*	*	*	*	*	255	67	214	60	154	25	76	14	175	42
9:00	*	*	*	*	*	*	308	84	326	83	255	58	137	24	256	62
10:00	*	*	*	*	*	*	342	117	368	107	338	99	169	46	304	92
11:00	*	*	*	*	*	*	336	132	322	157	301	126	237	59	299	118
12:00 PM	*	*	*	*	*	*	337	126	347	125	289	126	220	72	298	112
1:00	*	*	*	*	*	*	340	139	358	132	268	104	227	72	298	112
2:00	*	*	*	*	*	*	326	116	305	127	244	115	229	61	276	105
3:00	*	*	*	*	*	*	342	135	324	167	238	86	201	60	276	112
4:00	*	*	*	*	*	*	358	113	314	111	230	92	184	68	272	96
5:00	*	*	*	*	*	*	319	151	243	118	231	73	156	59	237	100
6:00	*	*	*	*	*	*	221	88	234	89	237	82	143	48	209	77
7:00	*	*	*	*	*	*	217	87	238	91	223	63	145	45	206	72
8:00	*	*	*	*	*	*	198	59	187	59	192	50	131	45	177	53
9:00	*	*	*	*	*	*	147	63	189	58	162	56	74	23	143	50
10:00	*	*	*	*	*	*	75	45	95	40	132	52	43	19	86	39
11:00	*	*	*	*	*	*	45	10	103	40	62	32	30	9	60	23
Total	0	0	0	0	0	0	4474	1618	4455	1669	3742	1316	2574	783	3811	1346
Day	0		0		0		6092		6124		5058		3357		5157	
AM Peak							10:00	11:00	10:00	11:00	10:00	11:00	11:00	11:00	10:00	11:00
Volume							342	132	368	157	338	126	237	59	304	118
PM Peak							4:00	5:00	1:00	3:00	12:00 PM	12:00 PM	2:00	12:00 PM	12:00 PM	12:00 PM
Volume							358	151	358	167	289	126	229	72	298	112
Comb Total	0		0		0		6092		6124		5058		3357		5157	
ADT	ADT: 5,158		AADT: 5,158													

Default Report Title
Use Preferences to Define Titles

Site Code:
Station ID: 0
Location 1: Alley
Location 2: Union to Pine
Location 3: Servicing Front St
Location 4:

Comment 1:
Comment 2:
Comment 3:
Comment 4:
Latitude: 0.000000
Longitude: 0.000000

8/24/2023 Time	West Bound, Lane 1	East Bound, Lane 2	Total
12:00 AM	2	4	6
1:00	0	0	0
2:00	0	0	0
3:00	0	0	0
4:00	1	0	1
5:00	0	2	2
6:00	10	8	18
7:00	7	11	18
8:00	7	20	27
9:00	4	22	26
10:00	6	11	17
11:00	7	15	22
12:00 PM	5	20	25
1:00	6	14	20
2:00	9	13	22
3:00	7	17	24
4:00	8	24	32
5:00	6	21	27
6:00	4	14	18
7:00	1	11	12
8:00	3	7	10
9:00	3	5	8
10:00	0	1	1
11:00	1	2	3
Total	97	242	339
Percent	28.6%	71.4%	
AM Peak	6:00	9:00	8:00
Volume	10	22	27
PM Peak	2:00	4:00	4:00
Volume	9	24	32

Default Report Title
Use Preferences to Define Titles

Site Code:
Station ID: 0
Location 1: Alley
Location 2: Union to Pine
Location 3: Servicing Front St
Location 4:

Comment 1:
Comment 2:
Comment 3:
Comment 4:
Latitude: 0.000000
Longitude: 0.000000

8/25/2023 Time	West Bound, Lane 1	East Bound, Lane 2	Total
12:00 AM	1	1	2
1:00	0	1	1
2:00	2	4	6
3:00	0	0	0
4:00	0	0	0
5:00	3	2	5
6:00	9	4	13
7:00	5	8	13
8:00	8	12	20
9:00	5	23	28
10:00	10	22	32
11:00	7	18	25
12:00 PM	8	22	30
1:00	7	21	28
2:00	4	15	19
3:00	9	13	22
4:00	5	25	30
5:00	5	23	28
6:00	3	6	9
7:00	0	11	11
8:00	5	7	12
9:00	2	9	11
10:00	2	11	13
11:00	2	4	6
Total	102	262	364
Percent	28.0%	72.0%	
AM Peak	10:00	9:00	10:00
Volume	10	23	32
PM Peak	3:00	4:00	12:00 PM
Volume	9	25	30

Default Report Title
Use Preferences to Define Titles

Site Code:
Station ID: 0
Location 1: Alley
Location 2: Union to Pine
Location 3: Servicing Front St
Location 4:

Comment 1:
Comment 2:
Comment 3:
Comment 4:
Latitude: 0.000000
Longitude: 0.000000

8/26/2023 Time	West Bound, Lane 1	East Bound, Lane 2	Total
12:00 AM	3	3	6
1:00	0	1	1
2:00	0	0	0
3:00	1	0	1
4:00	0	1	1
5:00	0	3	3
6:00	3	0	3
7:00	4	8	12
8:00	5	4	9
9:00	7	9	16
10:00	6	13	19
11:00	6	24	30
12:00 PM	5	11	16
1:00	6	8	14
2:00	5	17	22
3:00	5	11	16
4:00	3	16	19
5:00	1	13	14
6:00	4	13	17
7:00	4	9	13
8:00	3	8	11
9:00	1	7	8
10:00	3	4	7
11:00	5	6	11
Total	80	189	269
Percent	29.7%	70.3%	
AM Peak	9:00	11:00	11:00
Volume	7	24	30
PM Peak	1:00	2:00	2:00
Volume	6	17	22

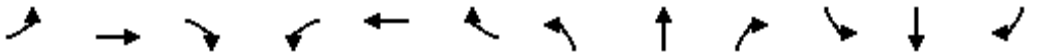
Default Report Title
Use Preferences to Define Titles

Site Code:
Station ID: 0
Location 1: Alley
Location 2: Union to Pine
Location 3: Servicing Front St
Location 4:

Comment 1:
Comment 2:
Comment 3:
Comment 4:
Latitude: 0.000000
Longitude: 0.000000

8/27/2023 Time	West Bound, Lane 1	East Bound, Lane 2	Total
12:00 AM	3	2	5
1:00	1	1	2
2:00	1	0	1
3:00	0	0	0
4:00	1	0	1
5:00	0	0	0
6:00	0	1	1
7:00	0	2	2
8:00	1	2	3
9:00	0	4	4
10:00	4	5	9
11:00	0	6	6
12:00 PM	0	5	5
1:00	4	9	13
2:00	2	5	7
3:00	1	8	9
4:00	0	6	6
5:00	0	7	7
6:00	1	3	4
7:00	0	1	1
8:00	0	5	5
9:00	2	6	8
10:00	0	5	5
11:00	1	2	3
Total	22	85	107
Percent	20.6%	79.4%	
AM Peak	10:00	11:00	10:00
Volume	4	6	9
PM Peak	1:00	1:00	1:00
Volume	4	9	13
Grand Total	301	778	1079
Percent	27.9%	72.1%	
ADT		ADT: 270	AADT: 270

Appendix 2



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	90	163	58	160	134	0	0	187	68
Future Volume (veh/h)	0	0	0	90	163	58	160	134	0	0	187	68
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		0.95	0.99		1.00	1.00		0.98
Parking Bus, Adj				0.85	1.00	0.85	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach					No			No			No	
Adj Sat Flow, veh/h/ln				1796	1796	1796	1826	1826	0	0	1826	1826
Adj Flow Rate, veh/h				102	185	66	222	186	0	0	228	83
Peak Hour Factor				0.88	0.88	0.88	0.72	0.72	0.72	0.82	0.82	0.82
Percent Heavy Veh, %				7	7	7	5	5	0	0	5	5
Cap, veh/h				534	1056	617	533	913	0	0	913	761
Arrive On Green				0.44	0.50	0.50	0.17	0.17	0.00	0.00	0.50	0.50
Sat Flow, veh/h				1068	2112	1234	1033	1826	0	0	1826	1521
Grp Volume(v), veh/h				141	146	66	222	186	0	0	228	83
Grp Sat Flow(s),veh/h/ln				1473	1706	1234	1033	1826	0	0	1826	1521
Q Serve(g_s), s				4.6	3.7	2.3	15.9	7.0	0.0	0.0	5.7	2.3
Cycle Q Clear(g_c), s				4.6	3.7	2.3	21.6	7.0	0.0	0.0	5.7	2.3
Prop In Lane				0.72		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				737	853	617	533	913	0	0	913	761
V/C Ratio(X)				0.19	0.17	0.11	0.42	0.20	0.00	0.00	0.25	0.11
Avail Cap(c_a), veh/h				737	853	617	533	913	0	0	913	761
HCM Platoon Ratio				1.00	1.00	1.00	0.33	0.33	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	1.00
Uniform Delay (d), s/veh				12.2	10.9	10.6	28.4	19.6	0.0	0.0	11.4	10.6
Incr Delay (d2), s/veh				0.6	0.4	0.3	2.4	0.5	0.0	0.0	0.7	0.3
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				1.6	1.5	0.6	4.7	3.3	0.0	0.0	2.4	0.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				12.7	11.4	10.9	30.7	20.1	0.0	0.0	12.1	10.9
LnGrp LOS				B	B	B	C	C	A	A	B	B
Approach Vol, veh/h					353			408			311	
Approach Delay, s/veh					11.8			25.9			11.8	
Approach LOS					B			C			B	

Timer - Assigned Phs		2				6		8				
Phs Duration (G+Y+Rc), s		40.0				40.0		40.0				
Change Period (Y+Rc), s		5.0				5.0		5.0				
Max Green Setting (Gmax), s		35.0				35.0		35.0				
Max Q Clear Time (g_c+I1), s		23.6				7.7		6.6				
Green Ext Time (p_c), s		1.7				1.7		2.1				

Intersection Summary												
HCM 6th Ctrl Delay			17.2									
HCM 6th LOS			B									



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	39	228	74	9	75	45	2	240	68	50	224	9
Future Volume (veh/h)	39	228	74	9	75	45	2	240	68	50	224	9
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.98		0.97	0.99		0.97	0.99		0.98	0.99		0.98
Parking Bus, Adj	1.00	1.00	0.85	1.00	1.00	1.00	1.00	1.00	0.85	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1826	1826	1826	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	46	271	88	10	80	48	3	312	88	59	264	11
Peak Hour Factor	0.84	0.84	0.84	0.94	0.94	0.94	0.77	0.77	0.77	0.85	0.85	0.85
Percent Heavy Veh, %	3	3	3	5	5	5	3	3	3	3	3	3
Cap, veh/h	102	518	158	75	513	288	491	589	166	398	884	37
Arrive On Green	0.44	0.50	0.44	0.44	0.50	0.44	0.50	0.50	0.44	0.17	0.17	0.14
Sat Flow, veh/h	104	1036	316	54	1027	576	1087	1178	332	972	1767	74
Grp Volume(v), veh/h	405	0	0	138	0	0	3	0	400	59	0	275
Grp Sat Flow(s),veh/h/ln	1457	0	0	1657	0	0	1087	0	1511	972	0	1841
Q Serve(g_s), s	3.5	0.0	0.0	0.0	0.0	0.0	0.1	0.0	14.7	4.4	0.0	10.5
Cycle Q Clear(g_c), s	16.1	0.0	0.0	3.7	0.0	0.0	10.6	0.0	14.7	19.1	0.0	10.5
Prop In Lane	0.11		0.22	0.07		0.35	1.00		0.22	1.00		0.04
Lane Grp Cap(c), veh/h	687	0	0	773	0	0	491	0	755	398	0	920
V/C Ratio(X)	0.59	0.00	0.00	0.18	0.00	0.00	0.01	0.00	0.53	0.15	0.00	0.30
Avail Cap(c_a), veh/h	687	0	0	773	0	0	491	0	755	398	0	920
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.33	0.33	0.33
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	14.6	0.0	0.0	11.5	0.0	0.0	16.0	0.0	14.0	31.4	0.0	21.1
Incr Delay (d2), s/veh	3.7	0.0	0.0	0.5	0.0	0.0	0.0	0.0	2.7	0.8	0.0	0.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	6.5	0.0	0.0	1.7	0.0	0.0	0.0	0.0	5.3	1.2	0.0	5.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	18.2	0.0	0.0	12.0	0.0	0.0	16.0	0.0	16.7	32.2	0.0	21.9
LnGrp LOS	B	A	A	B	A	A	B	A	B	C	A	C
Approach Vol, veh/h		405			138			403			334	
Approach Delay, s/veh		18.2			12.0			16.7			23.7	
Approach LOS		B			B			B			C	

Timer - Assigned Phs	2	4	6	8
Phs Duration (G+Y+Rc), s	40.0	40.0	40.0	40.0
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	35.0	35.0	35.0	35.0
Max Q Clear Time (g_c+I1), s	16.7	18.1	21.1	5.7
Green Ext Time (p_c), s	2.5	2.5	1.7	0.9

Intersection Summary	
HCM 6th Ctrl Delay	18.5
HCM 6th LOS	B

3: Pine Street & W Front Street Performance by movement

Movement	EBR	WBL	WBT	NBL	NBT	All
Denied Del/Veh (s)	0.3	0.4	0.3	0.0	0.0	0.3
Total Del/Veh (s)	1.4	9.6	8.0	7.4	0.3	5.5

3: Pine Street & W Front Street Performance by approach

Approach	EB	WB	NB	All
Denied Del/Veh (s)	0.3	0.3	0.0	0.3
Total Del/Veh (s)	1.4	8.4	6.8	5.5

Intersection	
Int Delay, s/veh	1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	2	5	75	11	49	339
Future Vol, veh/h	2	5	75	11	49	339
Conflicting Peds, #/hr	4	1	0	6	6	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	60	60	94	94	94	94
Heavy Vehicles, %	29	29	4	4	3	3
Mvmt Flow	3	8	80	12	52	361

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	561	93	0	0	98	0
Stage 1	92	-	-	-	-	-
Stage 2	469	-	-	-	-	-
Critical Hdwy	6.69	6.49	-	-	4.13	-
Critical Hdwy Stg 1	5.69	-	-	-	-	-
Critical Hdwy Stg 2	5.69	-	-	-	-	-
Follow-up Hdwy	3.761	3.561	-	-	2.227	-
Pot Cap-1 Maneuver	446	895	-	-	1489	-
Stage 1	868	-	-	-	-	-
Stage 2	577	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	422	889	-	-	1480	-
Mov Cap-2 Maneuver	422	-	-	-	-	-
Stage 1	863	-	-	-	-	-
Stage 2	549	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.4	0	0.9
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	675	1480	-
HCM Lane V/C Ratio	-	-	0.017	0.035	-
HCM Control Delay (s)	-	-	10.4	7.5	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0.1	-

Intersection	
Int Delay, s/veh	1.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		⇕			⇕			⇕			⇕	
Traffic Vol, veh/h	9	4	21	0	0	0	16	285	23	11	262	4
Future Vol, veh/h	9	4	21	0	0	0	16	285	23	11	262	4
Conflicting Peds, #/hr	5	0	5	5	0	5	15	0	10	10	0	15
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	71	71	71	92	92	92	86	86	86	70	70	70
Heavy Vehicles, %	0	0	0	2	2	2	2	2	2	3	3	3
Mvmt Flow	13	6	30	0	0	0	19	331	27	16	374	6

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	812	830	397	825	820	360	395	0	0	368	0	0
Stage 1	424	424	-	393	393	-	-	-	-	-	-	-
Stage 2	388	406	-	432	427	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.12	6.52	6.22	4.12	-	-	4.13	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.518	4.018	3.318	2.218	-	-	2.227	-	-
Pot Cap-1 Maneuver	300	308	657	292	310	684	1164	-	-	1185	-	-
Stage 1	612	590	-	632	606	-	-	-	-	-	-	-
Stage 2	640	601	-	602	585	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	286	289	645	263	291	674	1147	-	-	1174	-	-
Mov Cap-2 Maneuver	286	289	-	263	291	-	-	-	-	-	-	-
Stage 1	591	572	-	613	587	-	-	-	-	-	-	-
Stage 2	624	582	-	556	567	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	14.2	0	0.4	0.3
HCM LOS	B	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1147	-	-	437	-	1174	-	-
HCM Lane V/C Ratio	0.016	-	-	0.11	-	0.013	-	-
HCM Control Delay (s)	8.2	0	-	14.2	0	8.1	0	-
HCM Lane LOS	A	A	-	B	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.4	-	0	-	-

Intersection: 1: S Union Street/N Union Street & W Front Street/E Front Street

Movement	WB	WB	WB	NB	NB	SB	SB
Directions Served	LT	T	R	L	T	T	R
Maximum Queue (ft)	102	139	75	125	183	166	53
Average Queue (ft)	38	62	31	88	88	62	17
95th Queue (ft)	81	115	73	139	171	131	42
Link Distance (ft)	373	373			154	294	294
Upstream Blk Time (%)					3		
Queuing Penalty (veh)					9		
Storage Bay Dist (ft)			50	100			
Storage Blk Time (%)		15	1	13	5		
Queuing Penalty (veh)		9	1	20	9		

Intersection: 2: S Union Street & W State Street/E State Street

Movement	EB	WB	NB	NB	SB	SB
Directions Served	LTR	LTR	L	TR	L	TR
Maximum Queue (ft)	226	127	23	225	115	166
Average Queue (ft)	120	50	1	114	37	95
95th Queue (ft)	201	96	10	203	89	166
Link Distance (ft)	521	356	206	206		159
Upstream Blk Time (%)				1		1
Queuing Penalty (veh)				0		3
Storage Bay Dist (ft)					100	
Storage Blk Time (%)					0	6
Queuing Penalty (veh)					0	3

Intersection: 3: Pine Street & W Front Street

Movement	EB	WB	B13	NB
Directions Served	R	LT	T	L
Maximum Queue (ft)	78	122	181	86
Average Queue (ft)	16	84	36	33
95th Queue (ft)	55	114	118	68
Link Distance (ft)	330	20	436	169
Upstream Blk Time (%)		42		
Queuing Penalty (veh)		168		
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 4: Pine Street & Alley

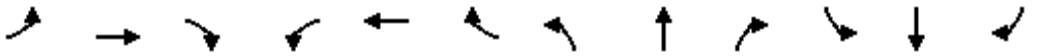
Movement	WB	NB	SB
Directions Served	LR	TR	LT
Maximum Queue (ft)	64	6	44
Average Queue (ft)	9	0	6
95th Queue (ft)	42	4	28
Link Distance (ft)	521	146	169
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 5: S Union Street & Alley

Movement	EB	NB	SB
Directions Served	LTR	LTR	LTR
Maximum Queue (ft)	53	86	86
Average Queue (ft)	22	12	10
95th Queue (ft)	48	51	50
Link Distance (ft)	521	159	154
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Zone Summary

Zone wide Queuing Penalty: 221



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	170	227	144	164	252	0	0	289	65
Future Volume (veh/h)	0	0	0	170	227	144	164	252	0	0	289	65
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		0.89	0.99		1.00	1.00		0.97
Parking Bus, Adj				0.85	1.00	0.85	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach					No			No			No	
Adj Sat Flow, veh/h/ln				1856	1856	1856	1870	1870	0	0	1841	1841
Adj Flow Rate, veh/h				195	261	166	184	283	0	0	361	81
Peak Hour Factor				0.87	0.87	0.87	0.89	0.89	0.89	0.80	0.80	0.80
Percent Heavy Veh, %				3	3	3	2	2	0	0	4	4
Cap, veh/h				664	973	593	444	935	0	0	920	756
Arrive On Green				0.44	0.50	0.50	0.17	0.17	0.00	0.00	0.50	0.50
Sat Flow, veh/h				1328	1945	1186	935	1870	0	0	1841	1511
Grp Volume(v), veh/h				222	234	166	184	283	0	0	361	81
Grp Sat Flow(s),veh/h/ln				1511	1763	1186	935	1870	0	0	1841	1511
Q Serve(g_s), s				7.5	6.1	6.5	14.7	10.6	0.0	0.0	9.8	2.3
Cycle Q Clear(g_c), s				7.5	6.1	6.5	24.5	10.6	0.0	0.0	9.8	2.3
Prop In Lane				0.88		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				755	881	593	444	935	0	0	920	756
V/C Ratio(X)				0.29	0.27	0.28	0.41	0.30	0.00	0.00	0.39	0.11
Avail Cap(c_a), veh/h				755	881	593	444	935	0	0	920	756
HCM Platoon Ratio				1.00	1.00	1.00	0.33	0.33	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	1.00
Uniform Delay (d), s/veh				13.2	11.5	11.6	31.5	21.1	0.0	0.0	12.4	10.6
Incr Delay (d2), s/veh				1.0	0.7	1.2	2.8	0.8	0.0	0.0	1.3	0.3
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				2.7	2.5	1.8	4.0	5.5	0.0	0.0	4.1	0.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				14.2	12.3	12.8	34.3	22.0	0.0	0.0	13.7	10.9
LnGrp LOS				B	B	B	C	C	A	A	B	B
Approach Vol, veh/h					622			467			442	
Approach Delay, s/veh					13.1			26.8			13.2	
Approach LOS					B			C			B	

Timer - Assigned Phs	2			6		8						
Phs Duration (G+Y+Rc), s	40.0			40.0		40.0						
Change Period (Y+Rc), s	5.0			5.0		5.0						
Max Green Setting (Gmax), s	35.0			35.0		35.0						
Max Q Clear Time (g_c+I1), s	26.5			11.8		9.5						
Green Ext Time (p_c), s	1.8			2.6		3.7						

Intersection Summary												
HCM 6th Ctrl Delay		17.3										
HCM 6th LOS		B										



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	50	365	140	15	138	61	10	361	131	100	348	16
Future Volume (veh/h)	50	365	140	15	138	61	10	361	131	100	348	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.97		0.96	1.00		0.96	0.99		0.97	0.99		0.97
Parking Bus, Adj	1.00	1.00	0.85	1.00	1.00	1.00	1.00	1.00	0.85	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1885	1885	1885	1870	1870	1870	1885	1885	1885
Adj Flow Rate, veh/h	54	392	151	16	145	64	11	384	139	122	424	20
Peak Hour Factor	0.93	0.93	0.93	0.95	0.95	0.95	0.94	0.94	0.94	0.82	0.82	0.82
Percent Heavy Veh, %	3	3	3	1	1	1	2	2	2	1	1	1
Cap, veh/h	92	494	182	75	584	243	357	551	199	291	891	42
Arrive On Green	0.44	0.50	0.44	0.44	0.50	0.44	0.50	0.50	0.44	0.17	0.17	0.14
Sat Flow, veh/h	86	987	363	53	1168	486	938	1102	399	881	1782	84
Grp Volume(v), veh/h	597	0	0	225	0	0	11	0	523	122	0	444
Grp Sat Flow(s),veh/h/ln	1437	0	0	1707	0	0	938	0	1501	881	0	1867
Q Serve(g_s), s	20.3	0.0	0.0	0.0	0.0	0.0	0.7	0.0	21.7	10.7	0.0	17.3
Cycle Q Clear(g_c), s	31.7	0.0	0.0	6.2	0.0	0.0	17.9	0.0	21.7	32.4	0.0	17.3
Prop In Lane	0.09		0.25	0.07		0.28	1.00		0.27	1.00		0.05
Lane Grp Cap(c), veh/h	678	0	0	795	0	0	357	0	751	291	0	933
V/C Ratio(X)	0.88	0.00	0.00	0.28	0.00	0.00	0.03	0.00	0.70	0.42	0.00	0.48
Avail Cap(c_a), veh/h	678	0	0	795	0	0	357	0	751	291	0	933
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.33	0.33	0.33
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	18.5	0.0	0.0	12.1	0.0	0.0	20.7	0.0	15.9	40.8	0.0	23.9
Incr Delay (d2), s/veh	15.3	0.0	0.0	0.9	0.0	0.0	0.2	0.0	5.3	4.4	0.0	1.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.9	0.0	0.0	2.9	0.0	0.0	0.2	0.0	8.1	2.9	0.0	9.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	33.8	0.0	0.0	12.9	0.0	0.0	20.9	0.0	21.2	45.1	0.0	25.7
LnGrp LOS	C	A	A	B	A	A	C	A	C	D	A	C
Approach Vol, veh/h		597			225			534			566	
Approach Delay, s/veh		33.8			12.9			21.2			29.9	
Approach LOS		C			B			C			C	

Timer - Assigned Phs	2	4	6	8
Phs Duration (G+Y+Rc), s	40.0	40.0	40.0	40.0
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	35.0	35.0	35.0	35.0
Max Q Clear Time (g_c+I1), s	23.7	33.7	34.4	8.2
Green Ext Time (p_c), s	2.8	0.6	0.2	1.5

Intersection Summary	
HCM 6th Ctrl Delay	26.7
HCM 6th LOS	C

3: Pine Street & W Front Street Performance by movement

Movement	EBR	WBL	WBT	NBL	NBT	All
Denied Del/Veh (s)	0.5	7.8	6.7	0.1	0.0	3.1
Total Del/Veh (s)	2.6	20.4	14.8	11.8	1.1	9.4

3: Pine Street & W Front Street Performance by approach

Approach	EB	WB	NB	All
Denied Del/Veh (s)	0.5	6.9	0.1	3.1
Total Del/Veh (s)	2.6	16.0	11.3	9.4

Intersection	
Int Delay, s/veh	1.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	18	22	161	3	26	537
Future Vol, veh/h	18	22	161	3	26	537
Conflicting Peds, #/hr	3	24	0	9	9	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	77	77	79	79	88	88
Heavy Vehicles, %	0	0	1	1	3	3
Mvmt Flow	23	29	204	4	30	610

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	888	239	0	0	217	0
Stage 1	215	-	-	-	-	-
Stage 2	673	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.13	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.227	-
Pot Cap-1 Maneuver	317	805	-	-	1347	-
Stage 1	826	-	-	-	-	-
Stage 2	511	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	302	780	-	-	1335	-
Mov Cap-2 Maneuver	302	-	-	-	-	-
Stage 1	819	-	-	-	-	-
Stage 2	492	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	13.9	0	0.4
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	456	1335	-
HCM Lane V/C Ratio	-	-	0.114	0.022	-
HCM Control Delay (s)	-	-	13.9	7.8	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.4	0.1	-

Intersection	
Int Delay, s/veh	2.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		⇕			⇕			⇕			⇕	
Traffic Vol, veh/h	9	9	44	0	0	0	6	407	59	34	420	5
Future Vol, veh/h	9	9	44	0	0	0	6	407	59	34	420	5
Conflicting Peds, #/hr	5	0	21	21	0	5	98	0	74	74	0	98
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	62	62	62	92	92	92	93	93	93	88	88	88
Heavy Vehicles, %	0	0	0	2	2	2	3	3	3	1	1	1
Mvmt Flow	15	15	71	0	0	0	6	438	63	39	477	6

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1143	1243	599	1178	1215	549	581	0	0	575	0	0
Stage 1	656	656	-	556	556	-	-	-	-	-	-	-
Stage 2	487	587	-	622	659	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.12	6.52	6.22	4.13	-	-	4.11	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.518	4.018	3.318	2.227	-	-	2.209	-	-
Pot Cap-1 Maneuver	179	176	505	168	181	535	988	-	-	1003	-	-
Stage 1	458	465	-	515	513	-	-	-	-	-	-	-
Stage 2	566	500	-	474	461	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	153	139	449	113	143	495	896	-	-	932	-	-
Mov Cap-2 Maneuver	153	139	-	113	143	-	-	-	-	-	-	-
Stage 1	412	398	-	474	473	-	-	-	-	-	-	-
Stage 2	558	461	-	355	394	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	24.8	0	0.1	0.7
HCM LOS	C	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	896	-	-	280	-	932	-	-
HCM Lane V/C Ratio	0.007	-	-	0.357	-	0.041	-	-
HCM Control Delay (s)	9	0	-	24.8	0	9	0	-
HCM Lane LOS	A	A	-	C	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	1.6	-	0.1	-	-

Intersection: 1: S Union Street/N Union Street & W Front Street/E Front Street

Movement	WB	WB	WB	NB	NB	SB	SB
Directions Served	LT	T	R	L	T	T	R
Maximum Queue (ft)	169	212	75	125	197	263	103
Average Queue (ft)	78	91	53	104	134	104	22
95th Queue (ft)	142	172	89	150	197	209	72
Link Distance (ft)	373	373			154	294	294
Upstream Blk Time (%)					9	1	0
Queuing Penalty (veh)					39	0	0
Storage Bay Dist (ft)			50	100			
Storage Blk Time (%)		20	6	19	17		
Queuing Penalty (veh)		29	8	49	28		

Intersection: 2: S Union Street & W State Street/E State Street

Movement	EB	B7	WB	NB	NB	SB	SB
Directions Served	LTR	T	LTR	L	TR	L	TR
Maximum Queue (ft)	511	30	222	76	234	125	180
Average Queue (ft)	273	2	90	9	171	82	137
95th Queue (ft)	468	24	178	45	253	143	193
Link Distance (ft)	521	146	356	206	206		159
Upstream Blk Time (%)	2	0		0	8		7
Queuing Penalty (veh)	9	0		0	0		33
Storage Bay Dist (ft)						100	
Storage Blk Time (%)						10	18
Queuing Penalty (veh)						39	18

Intersection: 3: Pine Street & W Front Street

Movement	EB	WB	B13	B13	NB
Directions Served	R	LT		T	L
Maximum Queue (ft)	127	124	7	416	133
Average Queue (ft)	40	94	0	154	60
95th Queue (ft)	99	116	5	382	109
Link Distance (ft)	330	20	436	436	169
Upstream Blk Time (%)		69		1	0
Queuing Penalty (veh)		318		2	0
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 4: Pine Street & Alley

Movement	WB	NB	SB
Directions Served	LR	TR	LT
Maximum Queue (ft)	54	29	80
Average Queue (ft)	25	2	13
95th Queue (ft)	51	15	49
Link Distance (ft)	521	146	169
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

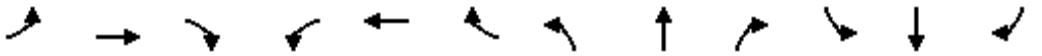
Intersection: 5: S Union Street & Alley

Movement	EB	NB	SB
Directions Served	LTR	LTR	LTR
Maximum Queue (ft)	145	149	161
Average Queue (ft)	41	45	57
95th Queue (ft)	101	129	146
Link Distance (ft)	521	159	154
Upstream Blk Time (%)		1	2
Queuing Penalty (veh)		4	13
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Zone Summary

Zone wide Queuing Penalty: 589

Appendix 3



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	78	199	47	147	147	0	0	162	59
Future Volume (veh/h)	0	0	0	78	199	47	147	147	0	0	162	59
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		0.95	0.99		1.00	1.00		0.98
Parking Bus, Adj				0.85	1.00	0.85	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach					No			No			No	
Adj Sat Flow, veh/h/ln				1796	1796	1796	1826	1826	0	0	1826	1826
Adj Flow Rate, veh/h				89	226	53	204	204	0	0	198	72
Peak Hour Factor				0.88	0.88	0.88	0.72	0.72	0.72	0.82	0.82	0.82
Percent Heavy Veh, %				7	7	7	5	5	0	0	5	5
Cap, veh/h				427	1169	617	561	913	0	0	913	761
Arrive On Green				0.44	0.50	0.50	0.17	0.17	0.00	0.00	0.50	0.50
Sat Flow, veh/h				853	2337	1234	1072	1826	0	0	1826	1521
Grp Volume(v), veh/h				155	160	53	204	204	0	0	198	72
Grp Sat Flow(s),veh/h/ln				1484	1706	1234	1072	1826	0	0	1826	1521
Q Serve(g_s), s				5.0	4.1	1.8	13.9	7.7	0.0	0.0	4.9	2.0
Cycle Q Clear(g_c), s				5.0	4.1	1.8	18.8	7.7	0.0	0.0	4.9	2.0
Prop In Lane				0.57		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				742	853	617	561	913	0	0	913	761
V/C Ratio(X)				0.21	0.19	0.09	0.36	0.22	0.00	0.00	0.22	0.09
Avail Cap(c_a), veh/h				742	853	617	561	913	0	0	913	761
HCM Platoon Ratio				1.00	1.00	1.00	0.33	0.33	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	1.00
Uniform Delay (d), s/veh				12.0	11.0	10.4	26.7	19.9	0.0	0.0	11.2	10.5
Incr Delay (d2), s/veh				0.6	0.5	0.3	1.8	0.6	0.0	0.0	0.5	0.2
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				1.7	1.6	0.5	4.2	3.7	0.0	0.0	2.0	0.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				12.7	11.5	10.7	28.6	20.5	0.0	0.0	11.8	10.7
LnGrp LOS				B	B	B	C	C	A	A	B	B
Approach Vol, veh/h					368			408			270	
Approach Delay, s/veh					11.9			24.5			11.5	
Approach LOS					B			C			B	

Timer - Assigned Phs	2		6		8							
Phs Duration (G+Y+Rc), s	40.0		40.0		40.0							
Change Period (Y+Rc), s	5.0		5.0		5.0							
Max Green Setting (Gmax), s	35.0		35.0		35.0							
Max Q Clear Time (g_c+I1), s	20.8		6.9		7.0							
Green Ext Time (p_c), s	1.8		1.5		2.2							

Intersection Summary		
HCM 6th Ctrl Delay	16.7	
HCM 6th LOS	B	



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	39	235	81	0	0	0	0	264	75	49	183	0
Future Volume (veh/h)	39	235	81	0	0	0	0	264	75	49	183	0
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97				1.00		0.99	1.00		1.00
Parking Bus, Adj	0.85	1.00	0.85				1.00	1.00	0.85	1.00	1.00	1.00
Work Zone On Approach		No						No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856				0	1856	1856	1856	1856	0
Adj Flow Rate, veh/h	46	280	96				0	343	97	58	215	0
Peak Hour Factor	0.84	0.84	0.84				0.77	0.77	0.77	0.85	0.85	0.85
Percent Heavy Veh, %	3	3	3				0	3	3	3	3	0
Cap, veh/h	158	984	352				0	928	579	453	928	0
Arrive On Green	0.44	0.50	0.44				0.00	0.50	0.44	0.17	0.17	0.00
Sat Flow, veh/h	316	1968	704				0	1856	1323	938	1856	0
Grp Volume(v), veh/h	227	0	195				0	343	97	58	215	0
Grp Sat Flow(s),veh/h/ln	1561	0	1427				0	1856	1323	938	1856	0
Q Serve(g_s), s	7.0	0.0	6.6				0.0	9.1	3.6	4.4	8.0	0.0
Cycle Q Clear(g_c), s	7.0	0.0	6.6				0.0	9.1	3.6	13.5	8.0	0.0
Prop In Lane	0.20		0.49				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	781	0	714				0	928	579	453	928	0
V/C Ratio(X)	0.29	0.00	0.27				0.00	0.37	0.17	0.13	0.23	0.00
Avail Cap(c_a), veh/h	781	0	714				0	928	579	453	928	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	0.33	0.33	1.00
Upstream Filter(I)	1.00	0.00	1.00				0.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	12.0	0.0	12.4				0.0	12.3	13.7	26.4	20.1	0.0
Incr Delay (d2), s/veh	0.9	0.0	0.9				0.0	1.1	0.6	0.6	0.6	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.5	0.0	2.2				0.0	3.8	1.1	1.2	3.9	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	13.0	0.0	13.3				0.0	13.4	14.3	26.9	20.6	0.0
LnGrp LOS	B	A	B				A	B	B	C	C	A
Approach Vol, veh/h		422						440			273	
Approach Delay, s/veh		13.1						13.6			22.0	
Approach LOS		B						B			C	

Timer - Assigned Phs	2	4	6
Phs Duration (G+Y+Rc), s	40.0	40.0	40.0
Change Period (Y+Rc), s	5.0	5.0	5.0
Max Green Setting (Gmax), s	35.0	35.0	35.0
Max Q Clear Time (g_c+I1), s	11.1	9.0	15.5
Green Ext Time (p_c), s	2.6	2.8	1.5

Intersection Summary	
HCM 6th Ctrl Delay	15.4
HCM 6th LOS	B

Intersection	
Int Delay, s/veh	1.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	8	0	0	0	37	347
Future Vol, veh/h	8	0	0	0	37	347
Conflicting Peds, #/hr	4	1	0	6	6	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	60	60	94	94	94	94
Heavy Vehicles, %	29	29	4	4	3	3
Mvmt Flow	13	0	0	0	39	369

Major/Minor	Minor1		Major2	
Conflicting Flow All	273	-	6	0
Stage 1	6	-	-	-
Stage 2	267	-	-	-
Critical Hdwy	7.38	-	4.16	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	6.38	-	-	-
Follow-up Hdwy	3.79	-	2.23	-
Pot Cap-1 Maneuver	624	0	1606	-
Stage 1	-	0	-	-
Stage 2	679	0	-	-
Platoon blocked, %				-
Mov Cap-1 Maneuver	601	-	1597	-
Mov Cap-2 Maneuver	601	-	-	-
Stage 1	-	-	-	-
Stage 2	658	-	-	-

Approach	WB	SB
HCM Control Delay, s	11.1	0.8
HCM LOS	B	

Minor Lane/Major Mvmt	WBLn1	SBL	SBT
Capacity (veh/h)	601	1597	-
HCM Lane V/C Ratio	0.022	0.025	-
HCM Control Delay (s)	11.1	7.3	0.1
HCM Lane LOS	B	A	A
HCM 95th %tile Q(veh)	0.1	0.1	-

Intersection	
Int Delay, s/veh	0.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		⇕			⇕			⇕			⇕	
Traffic Vol, veh/h	10	4	8	0	0	0	8	284	11	12	224	4
Future Vol, veh/h	10	4	8	0	0	0	8	284	11	12	224	4
Conflicting Peds, #/hr	5	0	5	5	0	5	15	0	10	10	0	15
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	71	71	71	92	92	92	86	86	86	70	70	70
Heavy Vehicles, %	0	0	0	2	2	2	2	2	2	3	3	3
Mvmt Flow	14	6	11	0	0	0	9	330	13	17	320	6

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	732	743	343	736	740	352	341	0	0	353	0	0
Stage 1	372	372	-	365	365	-	-	-	-	-	-	-
Stage 2	360	371	-	371	375	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.12	6.52	6.22	4.12	-	-	4.13	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.518	4.018	3.318	2.218	-	-	2.227	-	-
Pot Cap-1 Maneuver	339	346	704	335	345	692	1218	-	-	1200	-	-
Stage 1	653	622	-	654	623	-	-	-	-	-	-	-
Stage 2	662	623	-	649	617	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	326	329	691	314	328	682	1201	-	-	1189	-	-
Mov Cap-2 Maneuver	326	329	-	314	328	-	-	-	-	-	-	-
Stage 1	638	603	-	642	611	-	-	-	-	-	-	-
Stage 2	653	611	-	619	598	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	14.7	0	0.2	0.4
HCM LOS	B	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1201	-	-	404	-	1189	-	-
HCM Lane V/C Ratio	0.008	-	-	0.077	-	0.014	-	-
HCM Control Delay (s)	8	0	-	14.7	0	8.1	0	-
HCM Lane LOS	A	A	-	B	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.2	-	0	-	-

Intersection: 1: S Union Street/N Union Street & W Front Street/E Front Street

Movement	WB	WB	WB	NB	NB	SB	SB
Directions Served	LT	T	R	L	T	T	R
Maximum Queue (ft)	134	158	75	125	175	183	61
Average Queue (ft)	48	65	28	84	83	59	21
95th Queue (ft)	98	125	73	135	157	116	49
Link Distance (ft)	373	373			154	293	293
Upstream Blk Time (%)					2		
Queuing Penalty (veh)					6		
Storage Bay Dist (ft)			50	100			
Storage Blk Time (%)		17	0	11	6		
Queuing Penalty (veh)		8	0	18	10		

Intersection: 2: S Union Street & W State Street/E State Street

Movement	EB	EB	NB	NB	SB	SB
Directions Served	LT	TR	T	R	L	T
Maximum Queue (ft)	126	143	195	61	108	163
Average Queue (ft)	54	72	96	25	32	79
95th Queue (ft)	105	123	169	56	80	145
Link Distance (ft)	525	525	195	195		160
Upstream Blk Time (%)			0			1
Queuing Penalty (veh)			0			2
Storage Bay Dist (ft)					100	
Storage Blk Time (%)					0	4
Queuing Penalty (veh)					0	2

Intersection: 3: Pine Street & W Front Street

Movement	WB	WB
Directions Served	L	T
Maximum Queue (ft)	30	61
Average Queue (ft)	2	6
95th Queue (ft)	15	33
Link Distance (ft)	526	526
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 4: Pine Street & Alley

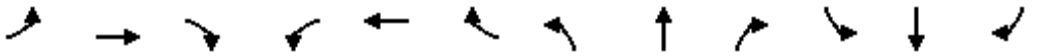
Movement	WB	SB	SB
Directions Served	L	LT	T
Maximum Queue (ft)	57	4	11
Average Queue (ft)	7	0	1
95th Queue (ft)	33	2	9
Link Distance (ft)	531	164	164
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 5: S Union Street & Alley

Movement	EB	NB	SB
Directions Served	LTR	LTR	LTR
Maximum Queue (ft)	40	92	86
Average Queue (ft)	17	9	8
95th Queue (ft)	44	47	43
Link Distance (ft)	531	160	154
Upstream Blk Time (%)			0
Queuing Penalty (veh)			0
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Zone Summary

Zone wide Queuing Penalty: 48



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	145	394	117	175	268	0	0	247	69
Future Volume (veh/h)	0	0	0	145	394	117	175	268	0	0	247	69
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		0.89	0.99		1.00	1.00		0.97
Parking Bus, Adj				0.85	1.00	0.85	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach					No			No			No	
Adj Sat Flow, veh/h/ln				1856	1856	1856	1870	1870	0	0	1841	1841
Adj Flow Rate, veh/h				167	453	134	197	301	0	0	309	86
Peak Hour Factor				0.87	0.87	0.87	0.89	0.89	0.89	0.80	0.80	0.80
Percent Heavy Veh, %				3	3	3	2	2	0	0	4	4
Cap, veh/h				422	1226	593	479	935	0	0	920	756
Arrive On Green				0.44	0.50	0.50	0.17	0.17	0.00	0.00	0.50	0.50
Sat Flow, veh/h				845	2453	1186	975	1870	0	0	1841	1511
Grp Volume(v), veh/h				303	317	134	197	301	0	0	309	86
Grp Sat Flow(s),veh/h/ln				1535	1763	1186	975	1870	0	0	1841	1511
Q Serve(g_s), s				10.4	8.8	5.1	15.0	11.4	0.0	0.0	8.1	2.4
Cycle Q Clear(g_c), s				10.4	8.8	5.1	23.1	11.4	0.0	0.0	8.1	2.4
Prop In Lane				0.55		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				767	881	593	479	935	0	0	920	756
V/C Ratio(X)				0.40	0.36	0.23	0.41	0.32	0.00	0.00	0.34	0.11
Avail Cap(c_a), veh/h				767	881	593	479	935	0	0	920	756
HCM Platoon Ratio				1.00	1.00	1.00	0.33	0.33	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	1.00
Uniform Delay (d), s/veh				13.5	12.2	11.3	30.1	21.4	0.0	0.0	12.0	10.6
Incr Delay (d2), s/veh				1.5	1.1	0.9	2.6	0.9	0.0	0.0	1.0	0.3
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				3.8	3.5	1.4	4.2	5.9	0.0	0.0	3.4	0.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				15.0	13.3	12.2	32.7	22.4	0.0	0.0	13.0	10.9
LnGrp LOS				B	B	B	C	C	A	A	B	B
Approach Vol, veh/h					754			498			395	
Approach Delay, s/veh					13.8			26.4			12.5	
Approach LOS					B			C			B	

Timer - Assigned Phs	2		6		8			
Phs Duration (G+Y+Rc), s	40.0		40.0		40.0			
Change Period (Y+Rc), s	5.0		5.0		5.0			
Max Green Setting (Gmax), s	35.0		35.0		35.0			
Max Q Clear Time (g_c+I1), s	25.1		10.1		12.4			
Green Ext Time (p_c), s	2.1		2.3		4.7			

Intersection Summary		
HCM 6th Ctrl Delay	17.3	
HCM 6th LOS	B	



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	56	425	147	0	0	0	0	412	144	99	271	0
Future Volume (veh/h)	56	425	147	0	0	0	0	412	144	99	271	0
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.96				1.00		0.98	0.99		1.00
Parking Bus, Adj	0.85	1.00	0.85				1.00	1.00	0.85	1.00	1.00	1.00
Work Zone On Approach		No						No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856				0	1870	1870	1885	1885	0
Adj Flow Rate, veh/h	60	457	158				0	438	153	121	330	0
Peak Hour Factor	0.93	0.93	0.93				0.94	0.94	0.94	0.82	0.82	0.82
Percent Heavy Veh, %	3	3	3				0	2	2	1	1	0
Cap, veh/h	127	995	364				0	935	577	377	943	0
Arrive On Green	0.44	0.50	0.44				0.00	0.50	0.44	0.17	0.17	0.00
Sat Flow, veh/h	254	1990	728				0	1870	1320	828	1885	0
Grp Volume(v), veh/h	370	0	305				0	438	153	121	330	0
Grp Sat Flow(s),veh/h/ln	1565	0	1407				0	1870	1320	828	1885	0
Q Serve(g_s), s	12.5	0.0	11.6				0.0	12.2	5.9	10.9	12.4	0.0
Cycle Q Clear(g_c), s	12.5	0.0	11.6				0.0	12.2	5.9	23.1	12.4	0.0
Prop In Lane	0.16		0.52				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	782	0	704				0	935	577	377	943	0
V/C Ratio(X)	0.47	0.00	0.43				0.00	0.47	0.27	0.32	0.35	0.00
Avail Cap(c_a), veh/h	782	0	704				0	935	577	377	943	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	0.33	0.33	1.00
Upstream Filter(I)	1.00	0.00	1.00				0.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	13.4	0.0	13.7				0.0	13.1	14.3	32.0	21.9	0.0
Incr Delay (d2), s/veh	2.0	0.0	1.9				0.0	1.7	1.1	2.2	1.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.6	0.0	3.9				0.0	5.3	1.9	2.6	6.5	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	15.4	0.0	15.7				0.0	14.7	15.4	34.3	22.9	0.0
LnGrp LOS	B	A	B				A	B	B	C	C	A
Approach Vol, veh/h		675						591			451	
Approach Delay, s/veh		15.6						14.9			26.0	
Approach LOS		B						B			C	

Timer - Assigned Phs	2	4	6
Phs Duration (G+Y+Rc), s	40.0	40.0	40.0
Change Period (Y+Rc), s	5.0	5.0	5.0
Max Green Setting (Gmax), s	35.0	35.0	35.0
Max Q Clear Time (g_c+I1), s	14.2	14.5	25.1
Green Ext Time (p_c), s	3.4	4.6	2.0

Intersection Summary	
HCM 6th Ctrl Delay	18.1
HCM 6th LOS	B

Intersection	
Int Delay, s/veh	1.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	44	0	0	0	19	584
Future Vol, veh/h	44	0	0	0	19	584
Conflicting Peds, #/hr	3	24	0	9	9	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	77	77	79	79	88	88
Heavy Vehicles, %	0	0	1	1	3	3
Mvmt Flow	57	0	0	0	22	664

Major/Minor	Minor1		Major2	
Conflicting Flow All	388	-	9	0
Stage 1	9	-	-	-
Stage 2	379	-	-	-
Critical Hdwy	6.8	-	4.16	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	5.8	-	-	-
Follow-up Hdwy	3.5	-	2.23	-
Pot Cap-1 Maneuver	593	0	1602	-
Stage 1	-	0	-	-
Stage 2	668	0	-	-
Platoon blocked, %				-
Mov Cap-1 Maneuver	575	-	1588	-
Mov Cap-2 Maneuver	575	-	-	-
Stage 1	-	-	-	-
Stage 2	653	-	-	-

Approach	WB	SB
HCM Control Delay, s	12	0.3
HCM LOS	B	

Minor Lane/Major Mvmt	WBLn1	SBL	SBT
Capacity (veh/h)	575	1588	-
HCM Lane V/C Ratio	0.099	0.014	-
HCM Control Delay (s)	12	7.3	0.1
HCM Lane LOS	B	A	A
HCM 95th %tile Q(veh)	0.3	0	-

Intersection	
Int Delay, s/veh	2.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		⇕			⇕			⇕			⇕	
Traffic Vol, veh/h	10	10	21	0	0	0	3	433	32	37	349	6
Future Vol, veh/h	10	10	21	0	0	0	3	433	32	37	349	6
Conflicting Peds, #/hr	5	0	21	21	0	5	98	0	74	74	0	98
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	62	62	62	92	92	92	93	93	93	88	88	88
Heavy Vehicles, %	0	0	0	2	2	2	3	3	3	1	1	1
Mvmt Flow	16	16	34	0	0	0	3	466	34	42	397	7

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1077	1163	520	1094	1149	562	502	0	0	574	0	0
Stage 1	583	583	-	563	563	-	-	-	-	-	-	-
Stage 2	494	580	-	531	586	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.12	6.52	6.22	4.13	-	-	4.11	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.518	4.018	3.318	2.227	-	-	2.209	-	-
Pot Cap-1 Maneuver	198	196	560	191	198	526	1057	-	-	1004	-	-
Stage 1	502	502	-	511	509	-	-	-	-	-	-	-
Stage 2	561	503	-	532	497	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	170	155	498	142	157	487	958	-	-	933	-	-
Mov Cap-2 Maneuver	170	155	-	142	157	-	-	-	-	-	-	-
Stage 1	453	429	-	473	471	-	-	-	-	-	-	-
Stage 2	556	466	-	441	424	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	24.7	0	0.1	0.9
HCM LOS	C	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	958	-	-	248	-	933	-	-
HCM Lane V/C Ratio	0.003	-	-	0.267	-	0.045	-	-
HCM Control Delay (s)	8.8	0	-	24.7	0	9	0	-
HCM Lane LOS	A	A	-	C	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	1	-	0.1	-	-

Intersection: 1: S Union Street/N Union Street & W Front Street/E Front Street

Movement	WB	WB	WB	NB	NB	SB	SB
Directions Served	LT	T	R	L	T	T	R
Maximum Queue (ft)	212	278	75	125	196	208	69
Average Queue (ft)	94	131	49	107	140	89	25
95th Queue (ft)	168	233	92	144	199	161	57
Link Distance (ft)	373	373			154	293	293
Upstream Blk Time (%)					10		
Queuing Penalty (veh)					44		
Storage Bay Dist (ft)			50	100			
Storage Blk Time (%)		31	2	17	21		
Queuing Penalty (veh)		36	5	46	37		

Intersection: 2: S Union Street & W State Street/E State Street

Movement	EB	EB	NB	NB	SB	SB
Directions Served	LT	TR	T	R	L	T
Maximum Queue (ft)	169	200	221	74	125	179
Average Queue (ft)	95	112	147	37	70	111
95th Queue (ft)	153	180	226	65	133	178
Link Distance (ft)	525	525	195	195		159
Upstream Blk Time (%)			3			2
Queuing Penalty (veh)			0			8
Storage Bay Dist (ft)					100	
Storage Blk Time (%)					4	11
Queuing Penalty (veh)					10	11

Intersection: 3: Pine Street & W Front Street

Movement	WB	WB
Directions Served	L	T
Maximum Queue (ft)	62	80
Average Queue (ft)	10	14
95th Queue (ft)	38	55
Link Distance (ft)	526	526
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 4: Pine Street & Alley

Movement	WB	SB	SB
Directions Served	L	LT	T
Maximum Queue (ft)	53	71	63
Average Queue (ft)	24	5	5
95th Queue (ft)	50	34	32
Link Distance (ft)	532	176	176
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

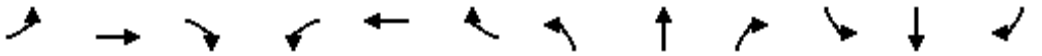
Intersection: 5: S Union Street & Alley

Movement	EB	NB	SB
Directions Served	LTR	LTR	LTR
Maximum Queue (ft)	75	158	137
Average Queue (ft)	23	52	36
95th Queue (ft)	55	139	101
Link Distance (ft)	532	159	154
Upstream Blk Time (%)		0	0
Queuing Penalty (veh)		2	0
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Zone Summary

Zone wide Queuing Penalty: 199

Appendix 4



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	112	204	58	160	155	0	0	224	82
Future Volume (veh/h)	0	0	0	112	204	58	160	155	0	0	224	82
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		0.95	0.99		1.00	1.00		0.98
Parking Bus, Adj				0.85	1.00	0.85	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach					No			No			No	
Adj Sat Flow, veh/h/ln				1796	1796	1796	1826	1826	0	0	1826	1826
Adj Flow Rate, veh/h				127	232	66	222	215	0	0	273	100
Peak Hour Factor				0.88	0.88	0.88	0.72	0.72	0.72	0.82	0.82	0.82
Percent Heavy Veh, %				7	7	7	5	5	0	0	5	5
Cap, veh/h				532	1058	617	493	913	0	0	913	761
Arrive On Green				0.44	0.50	0.50	0.17	0.17	0.00	0.00	0.50	0.50
Sat Flow, veh/h				1065	2115	1234	977	1826	0	0	1826	1521
Grp Volume(v), veh/h				176	183	66	222	215	0	0	273	100
Grp Sat Flow(s),veh/h/ln				1474	1706	1234	977	1826	0	0	1826	1521
Q Serve(g_s), s				5.8	4.8	2.3	17.0	8.2	0.0	0.0	7.0	2.8
Cycle Q Clear(g_c), s				5.8	4.8	2.3	24.0	8.2	0.0	0.0	7.0	2.8
Prop In Lane				0.72		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				737	853	617	493	913	0	0	913	761
V/C Ratio(X)				0.24	0.21	0.11	0.45	0.24	0.00	0.00	0.30	0.13
Avail Cap(c_a), veh/h				737	853	617	493	913	0	0	913	761
HCM Platoon Ratio				1.00	1.00	1.00	0.33	0.33	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	1.00
Uniform Delay (d), s/veh				12.5	11.2	10.6	30.0	20.1	0.0	0.0	11.8	10.7
Incr Delay (d2), s/veh				0.8	0.6	0.3	3.0	0.6	0.0	0.0	0.8	0.4
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				2.0	1.9	0.6	4.8	3.9	0.0	0.0	2.9	1.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				13.3	11.8	10.9	33.0	20.7	0.0	0.0	12.6	11.1
LnGrp LOS				B	B	B	C	C	A	A	B	B
Approach Vol, veh/h					425			437			373	
Approach Delay, s/veh					12.3			26.9			12.2	
Approach LOS					B			C			B	

Timer - Assigned Phs	2			6		8					
Phs Duration (G+Y+Rc), s	40.0			40.0		40.0					
Change Period (Y+Rc), s	5.0			5.0		5.0					
Max Green Setting (Gmax), s	35.0			35.0		35.0					
Max Q Clear Time (g_c+I1), s	26.0			9.0		7.8					
Green Ext Time (p_c), s	1.7			2.1		2.6					

Intersection Summary		
HCM 6th Ctrl Delay	17.4	
HCM 6th LOS	B	



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	58	246	84	9	91	55	52	252	68	69	247	9
Future Volume (veh/h)	58	246	84	9	91	55	52	252	68	69	247	9
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.98		0.97	0.99		0.97	0.99		0.98	1.00		0.98
Parking Bus, Adj	1.00	1.00	0.85	1.00	1.00	1.00	1.00	1.00	0.85	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1826	1826	1826	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	69	293	100	10	97	59	68	327	88	81	291	11
Peak Hour Factor	0.84	0.84	0.84	0.94	0.94	0.94	0.77	0.77	0.77	0.85	0.85	0.85
Percent Heavy Veh, %	3	3	3	5	5	5	3	3	3	3	3	3
Cap, veh/h	128	483	154	68	516	296	467	596	160	385	887	34
Arrive On Green	0.44	0.50	0.44	0.44	0.50	0.44	0.50	0.50	0.44	0.17	0.17	0.14
Sat Flow, veh/h	153	965	309	40	1033	591	1061	1192	321	959	1775	67
Grp Volume(v), veh/h	462	0	0	166	0	0	68	0	415	81	0	302
Grp Sat Flow(s),veh/h/ln	1427	0	0	1664	0	0	1061	0	1513	959	0	1842
Q Serve(g_s), s	11.1	0.0	0.0	0.0	0.0	0.0	3.5	0.0	15.4	6.2	0.0	11.6
Cycle Q Clear(g_c), s	20.5	0.0	0.0	4.6	0.0	0.0	15.1	0.0	15.4	21.6	0.0	11.6
Prop In Lane	0.15		0.22	0.06		0.36	1.00		0.21	1.00		0.04
Lane Grp Cap(c), veh/h	676	0	0	776	0	0	467	0	756	385	0	921
V/C Ratio(X)	0.68	0.00	0.00	0.21	0.00	0.00	0.15	0.00	0.55	0.21	0.00	0.33
Avail Cap(c_a), veh/h	676	0	0	776	0	0	467	0	756	385	0	921
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.33	0.33	0.33
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	15.7	0.0	0.0	11.7	0.0	0.0	17.8	0.0	14.2	32.8	0.0	21.6
Incr Delay (d2), s/veh	5.5	0.0	0.0	0.6	0.0	0.0	0.7	0.0	2.9	1.2	0.0	1.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	8.2	0.0	0.0	2.0	0.0	0.0	0.9	0.0	5.6	1.7	0.0	5.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	21.2	0.0	0.0	12.4	0.0	0.0	18.4	0.0	17.1	34.1	0.0	22.5
LnGrp LOS	C	A	A	B	A	A	B	A	B	C	A	C
Approach Vol, veh/h		462			166			483			383	
Approach Delay, s/veh		21.2			12.4			17.3			25.0	
Approach LOS		C			B			B			C	

Timer - Assigned Phs	2	4	6	8
Phs Duration (G+Y+Rc), s	40.0	40.0	40.0	40.0
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	35.0	35.0	35.0	35.0
Max Q Clear Time (g_c+I1), s	17.4	22.5	23.6	6.6
Green Ext Time (p_c), s	2.9	2.6	1.7	1.1

Intersection Summary	
HCM 6th Ctrl Delay	19.9
HCM 6th LOS	B

3: Pine Street & W Front Street Performance by movement

Movement	EBR	WBL	WBT	NBL	NBT	All
Denied Del/Veh (s)	0.4	2.0	0.6	0.0	0.0	0.7
Total Del/Veh (s)	1.7	13.4	11.5	8.7	0.6	7.7

3: Pine Street & W Front Street Performance by approach

Approach	EB	WB	NB	All
Denied Del/Veh (s)	0.4	1.1	0.0	0.7
Total Del/Veh (s)	1.7	12.2	8.1	7.7

Intersection	
Int Delay, s/veh	5.5

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	49	45	75	77	162	339
Future Vol, veh/h	49	45	75	77	162	339
Conflicting Peds, #/hr	4	1	0	6	6	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	60	60	94	94	94	94
Heavy Vehicles, %	29	29	4	4	3	3
Mvmt Flow	82	75	80	82	172	361

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	836	128	0	0	168	0
Stage 1	127	-	-	-	-	-
Stage 2	709	-	-	-	-	-
Critical Hdwy	6.69	6.49	-	-	4.13	-
Critical Hdwy Stg 1	5.69	-	-	-	-	-
Critical Hdwy Stg 2	5.69	-	-	-	-	-
Follow-up Hdwy	3.761	3.561	-	-	2.227	-
Pot Cap-1 Maneuver	304	855	-	-	1404	-
Stage 1	836	-	-	-	-	-
Stage 2	442	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	255	849	-	-	1396	-
Mov Cap-2 Maneuver	255	-	-	-	-	-
Stage 1	831	-	-	-	-	-
Stage 2	373	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	20.8	0	2.6
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	383	1396	-
HCM Lane V/C Ratio	-	-	0.409	0.123	-
HCM Control Delay (s)	-	-	20.8	7.9	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	1.9	0.4	-

Intersection	
Int Delay, s/veh	2.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		⇕			⇕			⇕			⇕	
Traffic Vol, veh/h	11	4	63	0	0	0	38	304	23	11	262	63
Future Vol, veh/h	11	4	63	0	0	0	38	304	23	11	262	63
Conflicting Peds, #/hr	5	0	5	5	0	5	15	0	10	10	0	15
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	71	71	71	92	92	92	86	86	86	70	70	70
Heavy Vehicles, %	0	0	0	2	2	2	2	2	2	3	3	3
Mvmt Flow	15	6	89	0	0	0	44	353	27	16	374	90

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	926	944	439	969	976	382	479	0	0	390	0	0
Stage 1	466	466	-	465	465	-	-	-	-	-	-	-
Stage 2	460	478	-	504	511	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.12	6.52	6.22	4.12	-	-	4.13	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.518	4.018	3.318	2.218	-	-	2.227	-	-
Pot Cap-1 Maneuver	251	264	622	233	251	665	1083	-	-	1163	-	-
Stage 1	581	566	-	578	563	-	-	-	-	-	-	-
Stage 2	585	559	-	550	537	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	233	240	610	182	228	656	1068	-	-	1152	-	-
Mov Cap-2 Maneuver	233	240	-	182	228	-	-	-	-	-	-	-
Stage 1	543	547	-	543	529	-	-	-	-	-	-	-
Stage 2	552	525	-	454	519	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	15.1	0	0.9	0.3
HCM LOS	C	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1068	-	-	467	-	1152	-	-
HCM Lane V/C Ratio	0.041	-	-	0.235	-	0.014	-	-
HCM Control Delay (s)	8.5	0	-	15.1	0	8.2	0	-
HCM Lane LOS	A	A	-	C	A	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0.9	-	0	-	-

Intersection	
Int Delay, s/veh	4.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	34	179	81	20	87	44
Future Vol, veh/h	34	179	81	20	87	44
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	37	195	88	22	95	48

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	232	0	333	135
Stage 1	-	-	-	-	135	-
Stage 2	-	-	-	-	198	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1336	-	662	914
Stage 1	-	-	-	-	891	-
Stage 2	-	-	-	-	835	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1336	-	618	914
Mov Cap-2 Maneuver	-	-	-	-	618	-
Stage 1	-	-	-	-	891	-
Stage 2	-	-	-	-	779	-

Approach	EB	WB	NB
HCM Control Delay, s	0	6.3	11.5
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	693	-	-	1336	-
HCM Lane V/C Ratio	0.205	-	-	0.066	-
HCM Control Delay (s)	11.5	-	-	7.9	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.8	-	-	0.2	-

Intersection: 1: S Union Street/N Union Street & W Front Street/E Front Street

Movement	WB	WB	WB	NB	NB	SB	SB
Directions Served	LT	T	R	L	T	T	R
Maximum Queue (ft)	154	197	75	125	182	185	66
Average Queue (ft)	48	83	35	89	88	76	25
95th Queue (ft)	109	157	82	138	167	147	53
Link Distance (ft)	373	373			154	294	294
Upstream Blk Time (%)					2		
Queuing Penalty (veh)					8		
Storage Bay Dist (ft)			50	100			
Storage Blk Time (%)		20	1	14	7		
Queuing Penalty (veh)		12	1	23	12		

Intersection: 2: S Union Street & W State Street/E State Street

Movement	EB	WB	NB	NB	SB	SB
Directions Served	LTR	LTR	L	TR	L	TR
Maximum Queue (ft)	277	138	89	225	124	168
Average Queue (ft)	146	60	34	118	52	104
95th Queue (ft)	234	109	74	208	112	171
Link Distance (ft)	521	356	206	206		159
Upstream Blk Time (%)				2		1
Queuing Penalty (veh)				0		4
Storage Bay Dist (ft)					100	
Storage Blk Time (%)					1	7
Queuing Penalty (veh)					2	5

Intersection: 3: Pine Street & W Front Street

Movement	EB	WB	B13	B13	NB
Directions Served	R	LT		T	L
Maximum Queue (ft)	99	134	86	364	91
Average Queue (ft)	24	96	5	107	38
95th Queue (ft)	69	126	79	297	70
Link Distance (ft)	330	20	436	436	169
Upstream Blk Time (%)		60		1	
Queuing Penalty (veh)		273		2	
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 4: Pine Street & Alley

Movement	WB	NB	SB
Directions Served	LR	TR	LT
Maximum Queue (ft)	148	25	97
Average Queue (ft)	50	1	30
95th Queue (ft)	103	9	75
Link Distance (ft)	237	146	169
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 5: S Union Street & Alley

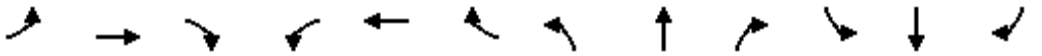
Movement	EB	NB	SB
Directions Served	LTR	LTR	LTR
Maximum Queue (ft)	89	128	127
Average Queue (ft)	37	26	20
95th Queue (ft)	70	88	78
Link Distance (ft)	228	159	154
Upstream Blk Time (%)		0	0
Queuing Penalty (veh)		2	0
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 6: Parking Structure & Alley

Movement	EB	WB	NB
Directions Served	TR	LT	LR
Maximum Queue (ft)	17	57	79
Average Queue (ft)	1	18	42
95th Queue (ft)	9	47	69
Link Distance (ft)	237	228	126
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Zone Summary

Zone wide Queuing Penalty: 344



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	191	256	144	164	313	0	0	315	71
Future Volume (veh/h)	0	0	0	191	256	144	164	313	0	0	315	71
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		0.89	0.99		1.00	1.00		0.97
Parking Bus, Adj				0.85	1.00	0.85	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach					No			No			No	
Adj Sat Flow, veh/h/ln				1856	1856	1856	1870	1870	0	0	1841	1841
Adj Flow Rate, veh/h				220	294	166	184	352	0	0	394	89
Peak Hour Factor				0.87	0.87	0.87	0.89	0.89	0.89	0.80	0.80	0.80
Percent Heavy Veh, %				3	3	3	2	2	0	0	4	4
Cap, veh/h				665	971	593	418	935	0	0	920	756
Arrive On Green				0.44	0.50	0.50	0.17	0.17	0.00	0.00	0.50	0.50
Sat Flow, veh/h				1331	1943	1186	902	1870	0	0	1841	1511
Grp Volume(v), veh/h				250	264	166	184	352	0	0	394	89
Grp Sat Flow(s),veh/h/ln				1511	1763	1186	902	1870	0	0	1841	1511
Q Serve(g_s), s				8.6	7.1	6.5	15.4	13.4	0.0	0.0	10.9	2.5
Cycle Q Clear(g_c), s				8.6	7.1	6.5	26.3	13.4	0.0	0.0	10.9	2.5
Prop In Lane				0.88		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				755	881	593	418	935	0	0	920	756
V/C Ratio(X)				0.33	0.30	0.28	0.44	0.38	0.00	0.00	0.43	0.12
Avail Cap(c_a), veh/h				755	881	593	418	935	0	0	920	756
HCM Platoon Ratio				1.00	1.00	1.00	0.33	0.33	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	1.00
Uniform Delay (d), s/veh				13.5	11.8	11.6	32.8	22.3	0.0	0.0	12.7	10.6
Incr Delay (d2), s/veh				1.2	0.9	1.2	3.3	1.2	0.0	0.0	1.5	0.3
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				3.1	2.8	1.8	4.1	6.9	0.0	0.0	4.6	0.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				14.7	12.6	12.8	36.2	23.5	0.0	0.0	14.2	10.9
LnGrp LOS				B	B	B	D	C	A	A	B	B
Approach Vol, veh/h					680			536			483	
Approach Delay, s/veh					13.4			27.8			13.6	
Approach LOS					B			C			B	

Timer - Assigned Phs	2			6		8						
Phs Duration (G+Y+Rc), s	40.0			40.0		40.0						
Change Period (Y+Rc), s	5.0			5.0		5.0						
Max Green Setting (Gmax), s	35.0			35.0		35.0						
Max Q Clear Time (g_c+I1), s	28.3			12.9		10.6						
Green Ext Time (p_c), s	1.8			2.9		4.1						

Intersection Summary		
HCM 6th Ctrl Delay		18.0
HCM 6th LOS		B



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	105	410	163	15	152	67	47	370	131	146	402	16
Future Volume (veh/h)	105	410	163	15	152	67	47	370	131	146	402	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.97		0.96	1.00		0.96	0.99		0.97	0.99		0.97
Parking Bus, Adj	1.00	1.00	0.85	1.00	1.00	1.00	1.00	1.00	0.85	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1885	1885	1885	1870	1870	1870	1885	1885	1885
Adj Flow Rate, veh/h	113	441	175	16	160	71	50	394	139	178	490	20
Peak Hour Factor	0.93	0.93	0.93	0.95	0.95	0.95	0.94	0.94	0.94	0.82	0.82	0.82
Percent Heavy Veh, %	3	3	3	1	1	1	2	2	2	1	1	1
Cap, veh/h	141	438	167	71	588	246	311	555	196	283	898	37
Arrive On Green	0.44	0.50	0.44	0.44	0.50	0.44	0.50	0.50	0.44	0.17	0.17	0.14
Sat Flow, veh/h	179	877	333	46	1175	493	884	1111	392	873	1796	73
Grp Volume(v), veh/h	729	0	0	247	0	0	50	0	533	178	0	510
Grp Sat Flow(s),veh/h/ln	1388	0	0	1714	0	0	884	0	1503	873	0	1869
Q Serve(g_s), s	28.1	0.0	0.0	0.0	0.0	0.0	3.6	0.0	22.3	16.2	0.0	20.0
Cycle Q Clear(g_c), s	35.0	0.0	0.0	6.9	0.0	0.0	23.6	0.0	22.3	38.5	0.0	20.0
Prop In Lane	0.16		0.24	0.06		0.29	1.00		0.26	1.00		0.04
Lane Grp Cap(c), veh/h	659	0	0	798	0	0	311	0	751	283	0	934
V/C Ratio(X)	1.11	0.00	0.00	0.31	0.00	0.00	0.16	0.00	0.71	0.63	0.00	0.55
Avail Cap(c_a), veh/h	659	0	0	798	0	0	311	0	751	283	0	934
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.33	0.33	0.33
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	20.8	0.0	0.0	12.2	0.0	0.0	23.9	0.0	16.1	43.9	0.0	25.1
Incr Delay (d2), s/veh	67.6	0.0	0.0	1.0	0.0	0.0	1.1	0.0	5.6	10.1	0.0	2.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	26.1	0.0	0.0	3.2	0.0	0.0	0.8	0.0	8.4	4.6	0.0	10.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	88.4	0.0	0.0	13.2	0.0	0.0	25.0	0.0	21.7	54.0	0.0	27.4
LnGrp LOS	F	A	A	B	A	A	C	A	C	D	A	C
Approach Vol, veh/h		729			247			583			688	
Approach Delay, s/veh		88.4			13.2			22.0			34.3	
Approach LOS		F			B			C			C	

Timer - Assigned Phs	2	4	6	8
Phs Duration (G+Y+Rc), s	40.0	40.0	40.0	40.0
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	35.0	35.0	35.0	35.0
Max Q Clear Time (g_c+I1), s	25.6	37.0	40.5	8.9
Green Ext Time (p_c), s	2.8	0.0	0.0	1.7

Intersection Summary	
HCM 6th Ctrl Delay	46.3
HCM 6th LOS	D

3: Pine Street & W Front Street Performance by movement

Movement	EBR	WBL	WBT	NBL	NBT	All
Denied Del/Veh (s)	692.7	174.3	79.1	22.7	0.0	473.6
Total Del/Veh (s)	163.7	138.7	61.9	32.1	1.2	105.0

3: Pine Street & W Front Street Performance by approach

Approach	EB	WB	NB	All
Denied Del/Veh (s)	692.7	102.7	20.7	473.6
Total Del/Veh (s)	164.5	80.3	29.4	105.0

Intersection	
Int Delay, s/veh	29.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	141	106	161	54	104	537
Future Vol, veh/h	141	106	161	54	104	537
Conflicting Peds, #/hr	3	24	0	9	9	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	77	77	79	79	88	88
Heavy Vehicles, %	0	0	1	1	3	3
Mvmt Flow	183	138	204	68	118	610

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1096	271	0	0	281	0
Stage 1	247	-	-	-	-	-
Stage 2	849	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.13	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.227	-
Pot Cap-1 Maneuver	238	773	-	-	1276	-
Stage 1	799	-	-	-	-	-
Stage 2	423	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	202	749	-	-	1265	-
Mov Cap-2 Maneuver	202	-	-	-	-	-
Stage 1	792	-	-	-	-	-
Stage 2	363	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	117.9	0	1.3
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	294	1265	-
HCM Lane V/C Ratio	-	-	1.091	0.093	-
HCM Control Delay (s)	-	-	117.9	8.1	0
HCM Lane LOS	-	-	F	A	A
HCM 95th %tile Q(veh)	-	-	12.8	0.3	-

Intersection	
Int Delay, s/veh	11.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	15	9	144	0	0	0	21	462	59	34	420	52
Future Vol, veh/h	15	9	144	0	0	0	21	462	59	34	420	52
Conflicting Peds, #/hr	5	0	21	21	0	5	98	0	74	74	0	98
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	62	62	62	92	92	92	93	93	93	88	88	88
Heavy Vehicles, %	0	0	0	2	2	2	3	3	3	1	1	1
Mvmt Flow	24	15	232	0	0	0	23	497	63	39	477	59

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1263	1363	626	1378	1361	608	634	0	0	634	0	0
Stage 1	683	683	-	649	649	-	-	-	-	-	-	-
Stage 2	580	680	-	729	712	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.12	6.52	6.22	4.13	-	-	4.11	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.518	4.018	3.318	2.227	-	-	2.209	-	-
Pot Cap-1 Maneuver	148	149	488	122	148	496	944	-	-	954	-	-
Stage 1	442	452	-	458	466	-	-	-	-	-	-	-
Stage 2	504	454	-	414	436	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	123	113	434	43	112	459	856	-	-	887	-	-
Mov Cap-2 Maneuver	123	113	-	43	112	-	-	-	-	-	-	-
Stage 1	385	384	-	409	417	-	-	-	-	-	-	-
Stage 2	482	406	-	170	371	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	58.6	0	0.4	0.6
HCM LOS	F	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	856	-	-	315	-	887	-	-
HCM Lane V/C Ratio	0.026	-	-	0.86	-	0.044	-	-
HCM Control Delay (s)	9.3	0	-	58.6	0	9.2	0	-
HCM Lane LOS	A	A	-	F	A	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	7.7	-	0.1	-	-

Intersection	
Int Delay, s/veh	8.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	62	129	62	11	207	106
Future Vol, veh/h	62	129	62	11	207	106
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	67	140	67	12	225	115

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	207	0	283	137
Stage 1	-	-	-	-	137	-
Stage 2	-	-	-	-	146	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1364	-	707	911
Stage 1	-	-	-	-	890	-
Stage 2	-	-	-	-	881	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1364	-	672	911
Mov Cap-2 Maneuver	-	-	-	-	672	-
Stage 1	-	-	-	-	890	-
Stage 2	-	-	-	-	838	-

Approach	EB	WB	NB
HCM Control Delay, s	0	6.6	14
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	738	-	-	1364	-
HCM Lane V/C Ratio	0.461	-	-	0.049	-
HCM Control Delay (s)	14	-	-	7.8	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	2.4	-	-	0.2	-

Intersection: 1: S Union Street/N Union Street & W Front Street/E Front Street

Movement	WB	WB	WB	NB	NB	SB	SB
Directions Served	LT	T	R	L	T	T	R
Maximum Queue (ft)	362	383	74	125	198	312	300
Average Queue (ft)	247	286	21	110	166	166	186
95th Queue (ft)	443	486	72	139	212	351	392
Link Distance (ft)	373	373			154	294	294
Upstream Blk Time (%)	38	62			70	27	53
Queuing Penalty (veh)	0	0			331	0	0
Storage Bay Dist (ft)			50	100			
Storage Blk Time (%)		78	1	73	8		
Queuing Penalty (veh)		112	2	226	14		

Intersection: 2: S Union Street & W State Street/E State Street

Movement	EB	B7	WB	NB	NB	SB	SB
Directions Served	LTR	T	LTR	L	TR	L	TR
Maximum Queue (ft)	605	189	361	94	234	125	188
Average Queue (ft)	542	124	246	12	202	45	72
95th Queue (ft)	707	221	458	50	248	133	193
Link Distance (ft)	521	146	356	206	206		159
Upstream Blk Time (%)	78	67	57		67		6
Queuing Penalty (veh)	529	448	0		0		36
Storage Bay Dist (ft)						100	
Storage Blk Time (%)						7	10
Queuing Penalty (veh)						35	16

Intersection: 3: Pine Street & W Front Street

Movement	EB	WB	B13	B13	NB
Directions Served	R	LT		T	L
Maximum Queue (ft)	342	110	172	452	129
Average Queue (ft)	231	86	101	380	47
95th Queue (ft)	445	103	393	582	114
Link Distance (ft)	330	20	436	436	169
Upstream Blk Time (%)	60	93	13	68	0
Queuing Penalty (veh)	0	457	32	166	0
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 4: Pine Street & Alley

Movement	WB	NB	SB
Directions Served	LR	TR	LT
Maximum Queue (ft)	245	34	189
Average Queue (ft)	194	2	140
95th Queue (ft)	318	15	235
Link Distance (ft)	237	146	169
Upstream Blk Time (%)	67		65
Queuing Penalty (veh)	145		411
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 5: S Union Street & Alley

Movement	EB	NB	SB
Directions Served	LTR	LTR	LTR
Maximum Queue (ft)	212	162	168
Average Queue (ft)	118	130	96
95th Queue (ft)	236	215	210
Link Distance (ft)	228	159	154
Upstream Blk Time (%)	8	65	38
Queuing Penalty (veh)	13	350	188
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

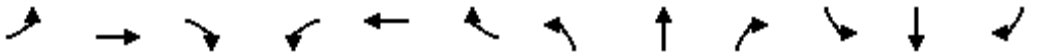
Intersection: 6: Parking Structure & Alley

Movement	EB	WB	NB
Directions Served	TR	LT	LR
Maximum Queue (ft)	78	104	150
Average Queue (ft)	9	43	112
95th Queue (ft)	59	166	165
Link Distance (ft)	237	228	126
Upstream Blk Time (%)		11	70
Queuing Penalty (veh)		8	0
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Zone Summary

Zone wide Queuing Penalty: 3519

Appendix 5



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	112	204	58	160	155	0	0	224	82
Future Volume (veh/h)	0	0	0	112	204	58	160	155	0	0	224	82
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		0.95	0.99		1.00	1.00		0.98
Parking Bus, Adj				0.85	1.00	0.85	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach					No			No			No	
Adj Sat Flow, veh/h/ln				1796	1796	1796	1826	1826	0	0	1826	1826
Adj Flow Rate, veh/h				127	232	66	222	215	0	0	273	100
Peak Hour Factor				0.88	0.88	0.88	0.72	0.72	0.72	0.82	0.82	0.82
Percent Heavy Veh, %				7	7	7	5	5	0	0	5	5
Cap, veh/h				532	1058	617	493	913	0	0	913	761
Arrive On Green				0.44	0.50	0.50	0.17	0.17	0.00	0.00	0.50	0.50
Sat Flow, veh/h				1065	2115	1234	977	1826	0	0	1826	1521
Grp Volume(v), veh/h				176	183	66	222	215	0	0	273	100
Grp Sat Flow(s),veh/h/ln				1474	1706	1234	977	1826	0	0	1826	1521
Q Serve(g_s), s				5.8	4.8	2.3	17.0	8.2	0.0	0.0	7.0	2.8
Cycle Q Clear(g_c), s				5.8	4.8	2.3	24.0	8.2	0.0	0.0	7.0	2.8
Prop In Lane				0.72		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				737	853	617	493	913	0	0	913	761
V/C Ratio(X)				0.24	0.21	0.11	0.45	0.24	0.00	0.00	0.30	0.13
Avail Cap(c_a), veh/h				737	853	617	493	913	0	0	913	761
HCM Platoon Ratio				1.00	1.00	1.00	0.33	0.33	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	1.00
Uniform Delay (d), s/veh				12.5	11.2	10.6	30.0	20.1	0.0	0.0	11.8	10.7
Incr Delay (d2), s/veh				0.8	0.6	0.3	3.0	0.6	0.0	0.0	0.8	0.4
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				2.0	1.9	0.6	4.8	3.9	0.0	0.0	2.9	1.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				13.3	11.8	10.9	33.0	20.7	0.0	0.0	12.6	11.1
LnGrp LOS				B	B	B	C	C	A	A	B	B
Approach Vol, veh/h					425			437			373	
Approach Delay, s/veh					12.3			26.9			12.2	
Approach LOS					B			C			B	

Timer - Assigned Phs	2		6		8			
Phs Duration (G+Y+Rc), s	40.0		40.0		40.0			
Change Period (Y+Rc), s	5.0		5.0		5.0			
Max Green Setting (Gmax), s	35.0		35.0		35.0			
Max Q Clear Time (g_c+I1), s	26.0		9.0		7.8			
Green Ext Time (p_c), s	1.7		2.1		2.6			

Intersection Summary	
HCM 6th Ctrl Delay	17.4
HCM 6th LOS	B



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	58	246	84	9	91	55	52	252	68	69	247	9
Future Volume (veh/h)	58	246	84	9	91	55	52	252	68	69	247	9
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.98		0.97	0.99		0.97	0.99		0.98	1.00		0.98
Parking Bus, Adj	1.00	1.00	0.85	1.00	1.00	1.00	1.00	1.00	0.85	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1826	1826	1826	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	69	293	100	10	97	59	68	327	88	81	291	11
Peak Hour Factor	0.84	0.84	0.84	0.94	0.94	0.94	0.77	0.77	0.77	0.85	0.85	0.85
Percent Heavy Veh, %	3	3	3	5	5	5	3	3	3	3	3	3
Cap, veh/h	627	558	190	68	516	296	467	596	160	385	887	34
Arrive On Green	0.44	0.50	0.44	0.44	0.50	0.44	0.50	0.50	0.44	0.17	0.17	0.14
Sat Flow, veh/h	1197	1115	381	40	1033	591	1061	1192	321	959	1775	67
Grp Volume(v), veh/h	69	0	393	166	0	0	68	0	415	81	0	302
Grp Sat Flow(s),veh/h/ln	1197	0	1496	1664	0	0	1061	0	1513	959	0	1842
Q Serve(g_s), s	0.0	0.0	14.5	0.0	0.0	0.0	3.5	0.0	15.4	6.2	0.0	11.6
Cycle Q Clear(g_c), s	2.3	0.0	14.5	4.6	0.0	0.0	15.1	0.0	15.4	21.6	0.0	11.6
Prop In Lane	1.00		0.25	0.06		0.36	1.00		0.21	1.00		0.04
Lane Grp Cap(c), veh/h	627	0	748	776	0	0	467	0	756	385	0	921
V/C Ratio(X)	0.11	0.00	0.53	0.21	0.00	0.00	0.15	0.00	0.55	0.21	0.00	0.33
Avail Cap(c_a), veh/h	627	0	748	776	0	0	467	0	756	385	0	921
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.33	0.33	0.33
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	13.3	0.0	14.1	11.7	0.0	0.0	17.8	0.0	14.2	32.8	0.0	21.6
Incr Delay (d2), s/veh	0.4	0.0	2.6	0.6	0.0	0.0	0.7	0.0	2.9	1.2	0.0	1.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.8	0.0	5.2	2.0	0.0	0.0	0.9	0.0	5.6	1.7	0.0	5.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	13.7	0.0	16.7	12.4	0.0	0.0	18.4	0.0	17.1	34.1	0.0	22.5
LnGrp LOS	B	A	B	B	A	A	B	A	B	C	A	C
Approach Vol, veh/h		462			166			483			383	
Approach Delay, s/veh		16.2			12.4			17.3			25.0	
Approach LOS		B			B			B			C	

Timer - Assigned Phs	2	4	6	8
Phs Duration (G+Y+Rc), s	40.0	40.0	40.0	40.0
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	35.0	35.0	35.0	35.0
Max Q Clear Time (g_c+I1), s	17.4	16.5	23.6	6.6
Green Ext Time (p_c), s	2.9	2.8	1.7	1.1

Intersection Summary	
HCM 6th Ctrl Delay	18.4
HCM 6th LOS	B

3: Pine Street & W Front Street Performance by movement

Movement	EBR	WBL	WBT	NBL	NBT	All
Denied Del/Veh (s)	0.3	0.0	0.0	0.0	0.0	0.1
Total Del/Veh (s)	1.9	11.9	9.2	8.2	0.8	6.7

3: Pine Street & W Front Street Performance by approach

Approach	EB	WB	NB	All
Denied Del/Veh (s)	0.3	0.0	0.0	0.1
Total Del/Veh (s)	1.9	10.0	7.6	6.7

Intersection	
Int Delay, s/veh	5.5

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	49	45	75	77	162	339
Future Vol, veh/h	49	45	75	77	162	339
Conflicting Peds, #/hr	4	1	0	6	6	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	60	60	94	94	94	94
Heavy Vehicles, %	29	29	4	4	3	3
Mvmt Flow	82	75	80	82	172	361

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	836	128	0	0	168	0
Stage 1	127	-	-	-	-	-
Stage 2	709	-	-	-	-	-
Critical Hdwy	6.69	6.49	-	-	4.13	-
Critical Hdwy Stg 1	5.69	-	-	-	-	-
Critical Hdwy Stg 2	5.69	-	-	-	-	-
Follow-up Hdwy	3.761	3.561	-	-	2.227	-
Pot Cap-1 Maneuver	304	855	-	-	1404	-
Stage 1	836	-	-	-	-	-
Stage 2	442	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	255	849	-	-	1396	-
Mov Cap-2 Maneuver	255	-	-	-	-	-
Stage 1	831	-	-	-	-	-
Stage 2	373	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	20.8	0	2.6
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	383	1396	-
HCM Lane V/C Ratio	-	-	0.409	0.123	-
HCM Control Delay (s)	-	-	20.8	7.9	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	1.9	0.4	-

Intersection	
Int Delay, s/veh	2.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		⇕			⇕			⇕			⇕	
Traffic Vol, veh/h	11	4	63	0	0	0	38	304	23	11	262	63
Future Vol, veh/h	11	4	63	0	0	0	38	304	23	11	262	63
Conflicting Peds, #/hr	5	0	5	5	0	5	15	0	10	10	0	15
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	71	71	71	92	92	92	86	86	86	70	70	70
Heavy Vehicles, %	0	0	0	2	2	2	2	2	2	3	3	3
Mvmt Flow	15	6	89	0	0	0	44	353	27	16	374	90

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	926	944	439	969	976	382	479	0	0	390	0	0
Stage 1	466	466	-	465	465	-	-	-	-	-	-	-
Stage 2	460	478	-	504	511	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.12	6.52	6.22	4.12	-	-	4.13	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.518	4.018	3.318	2.218	-	-	2.227	-	-
Pot Cap-1 Maneuver	251	264	622	233	251	665	1083	-	-	1163	-	-
Stage 1	581	566	-	578	563	-	-	-	-	-	-	-
Stage 2	585	559	-	550	537	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	233	240	610	182	228	656	1068	-	-	1152	-	-
Mov Cap-2 Maneuver	233	240	-	182	228	-	-	-	-	-	-	-
Stage 1	543	547	-	543	529	-	-	-	-	-	-	-
Stage 2	552	525	-	454	519	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	15.1	0	0.9	0.3
HCM LOS	C	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1068	-	-	467	-	1152	-	-
HCM Lane V/C Ratio	0.041	-	-	0.235	-	0.014	-	-
HCM Control Delay (s)	8.5	0	-	15.1	0	8.2	0	-
HCM Lane LOS	A	A	-	C	A	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0.9	-	0	-	-

Intersection	
Int Delay, s/veh	4.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	34	179	81	20	87	44
Future Vol, veh/h	34	179	81	20	87	44
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	37	195	88	22	95	48

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	232	0	333	135
Stage 1	-	-	-	-	135	-
Stage 2	-	-	-	-	198	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1336	-	662	914
Stage 1	-	-	-	-	891	-
Stage 2	-	-	-	-	835	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1336	-	618	914
Mov Cap-2 Maneuver	-	-	-	-	618	-
Stage 1	-	-	-	-	891	-
Stage 2	-	-	-	-	779	-

Approach	EB	WB	NB
HCM Control Delay, s	0	6.3	11.5
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	693	-	-	1336	-
HCM Lane V/C Ratio	0.205	-	-	0.066	-
HCM Control Delay (s)	11.5	-	-	7.9	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.8	-	-	0.2	-

Intersection: 1: S Union Street/N Union Street & W Front Street/E Front Street

Movement	WB	WB	WB	NB	NB	SB	SB
Directions Served	LT	T	R	L	T	T	R
Maximum Queue (ft)	172	148	75	125	198	187	64
Average Queue (ft)	79	58	30	84	97	73	23
95th Queue (ft)	142	117	72	138	179	141	50
Link Distance (ft)	373	373			154	294	294
Upstream Blk Time (%)					4		
Queuing Penalty (veh)					14		
Storage Bay Dist (ft)			50	100			
Storage Blk Time (%)		11	1	13	7		
Queuing Penalty (veh)		6	1	24	12		

Intersection: 2: S Union Street & W State Street/E State Street

Movement	EB	EB	WB	NB	NB	SB	SB
Directions Served	L	TR	LTR	L	TR	L	TR
Maximum Queue (ft)	123	271	127	83	218	121	166
Average Queue (ft)	36	115	55	33	115	49	97
95th Queue (ft)	95	207	109	72	200	105	161
Link Distance (ft)		520	356	200	200		154
Upstream Blk Time (%)					1		1
Queuing Penalty (veh)					0		4
Storage Bay Dist (ft)	100					100	
Storage Blk Time (%)	0	11				1	7
Queuing Penalty (veh)	0	6				4	5

Intersection: 3: Pine Street & W Front Street

Movement	EB	WB	WB	NB
Directions Served	R	L	T	L
Maximum Queue (ft)	101	129	151	98
Average Queue (ft)	28	58	74	41
95th Queue (ft)	76	102	121	76
Link Distance (ft)	331	512	512	165
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 4: Pine Street & Alley

Movement	WB	NB	SB
Directions Served	LR	TR	LT
Maximum Queue (ft)	130	32	125
Average Queue (ft)	52	2	30
95th Queue (ft)	99	14	82
Link Distance (ft)	237	146	165
Upstream Blk Time (%)			0
Queuing Penalty (veh)			0
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 5: S Union Street & Alley

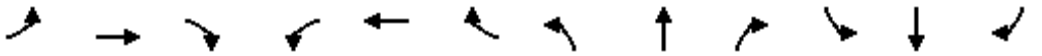
Movement	EB	NB	SB
Directions Served	LTR	LTR	LTR
Maximum Queue (ft)	97	159	115
Average Queue (ft)	35	28	14
95th Queue (ft)	67	94	62
Link Distance (ft)	228	154	154
Upstream Blk Time (%)		0	0
Queuing Penalty (veh)		1	0
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 6: Parking Structure & Alley

Movement	EB	WB	NB
Directions Served	TR	LT	LR
Maximum Queue (ft)	30	57	78
Average Queue (ft)	2	18	40
95th Queue (ft)	15	48	63
Link Distance (ft)	237	228	126
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Zone Summary

Zone wide Queuing Penalty: 77



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	191	256	144	164	313	0	0	315	71
Future Volume (veh/h)	0	0	0	191	256	144	164	313	0	0	315	71
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		0.89	0.99		1.00	1.00		0.97
Parking Bus, Adj				0.85	1.00	0.85	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach					No			No			No	
Adj Sat Flow, veh/h/ln				1856	1856	1856	1870	1870	0	0	1841	1841
Adj Flow Rate, veh/h				220	294	166	184	352	0	0	394	89
Peak Hour Factor				0.87	0.87	0.87	0.89	0.89	0.89	0.80	0.80	0.80
Percent Heavy Veh, %				3	3	3	2	2	0	0	4	4
Cap, veh/h				665	971	593	418	935	0	0	920	756
Arrive On Green				0.44	0.50	0.50	0.17	0.17	0.00	0.00	0.50	0.50
Sat Flow, veh/h				1331	1943	1186	902	1870	0	0	1841	1511
Grp Volume(v), veh/h				250	264	166	184	352	0	0	394	89
Grp Sat Flow(s),veh/h/ln				1511	1763	1186	902	1870	0	0	1841	1511
Q Serve(g_s), s				8.6	7.1	6.5	15.4	13.4	0.0	0.0	10.9	2.5
Cycle Q Clear(g_c), s				8.6	7.1	6.5	26.3	13.4	0.0	0.0	10.9	2.5
Prop In Lane				0.88		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				755	881	593	418	935	0	0	920	756
V/C Ratio(X)				0.33	0.30	0.28	0.44	0.38	0.00	0.00	0.43	0.12
Avail Cap(c_a), veh/h				755	881	593	418	935	0	0	920	756
HCM Platoon Ratio				1.00	1.00	1.00	0.33	0.33	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	1.00
Uniform Delay (d), s/veh				13.5	11.8	11.6	32.8	22.3	0.0	0.0	12.7	10.6
Incr Delay (d2), s/veh				1.2	0.9	1.2	3.3	1.2	0.0	0.0	1.5	0.3
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				3.1	2.8	1.8	4.1	6.9	0.0	0.0	4.6	0.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				14.7	12.6	12.8	36.2	23.5	0.0	0.0	14.2	10.9
LnGrp LOS				B	B	B	D	C	A	A	B	B
Approach Vol, veh/h					680			536			483	
Approach Delay, s/veh					13.4			27.8			13.6	
Approach LOS					B			C			B	

Timer - Assigned Phs	2			6		8						
Phs Duration (G+Y+Rc), s	40.0			40.0		40.0						
Change Period (Y+Rc), s	5.0			5.0		5.0						
Max Green Setting (Gmax), s	35.0			35.0		35.0						
Max Q Clear Time (g_c+I1), s	28.3			12.9		10.6						
Green Ext Time (p_c), s	1.8			2.9		4.1						

Intersection Summary												
HCM 6th Ctrl Delay		18.0										
HCM 6th LOS		B										



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	105	410	163	15	152	67	47	370	131	146	402	16
Future Volume (veh/h)	105	410	163	15	152	67	47	370	131	146	402	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.96	1.00		0.96	0.99		0.97	0.99		0.97
Parking Bus, Adj	1.00	1.00	0.85	1.00	1.00	1.00	1.00	1.00	0.85	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1885	1885	1885	1870	1870	1870	1885	1885	1885
Adj Flow Rate, veh/h	113	441	175	16	160	71	50	394	139	178	490	20
Peak Hour Factor	0.93	0.93	0.93	0.95	0.95	0.95	0.94	0.94	0.94	0.82	0.82	0.82
Percent Heavy Veh, %	3	3	3	1	1	1	2	2	2	1	1	1
Cap, veh/h	259	529	210	57	452	186	311	555	196	283	898	37
Arrive On Green	0.44	0.50	0.44	0.44	0.50	0.44	0.50	0.50	0.44	0.17	0.17	0.14
Sat Flow, veh/h	1140	1059	420	19	903	372	884	1111	392	873	1796	73
Grp Volume(v), veh/h	113	0	616	247	0	0	50	0	533	178	0	510
Grp Sat Flow(s),veh/h/ln	1140	0	1479	1294	0	0	884	0	1503	873	0	1869
Q Serve(g_s), s	0.1	0.0	28.8	1.8	0.0	0.0	3.6	0.0	22.3	16.2	0.0	20.0
Cycle Q Clear(g_c), s	30.7	0.0	28.8	30.6	0.0	0.0	23.6	0.0	22.3	38.5	0.0	20.0
Prop In Lane	1.00		0.28	0.06		0.29	1.00		0.26	1.00		0.04
Lane Grp Cap(c), veh/h	259	0	740	614	0	0	311	0	751	283	0	934
V/C Ratio(X)	0.44	0.00	0.83	0.40	0.00	0.00	0.16	0.00	0.71	0.63	0.00	0.55
Avail Cap(c_a), veh/h	259	0	740	614	0	0	311	0	751	283	0	934
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.33	0.33	0.33
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	21.4	0.0	17.8	12.9	0.0	0.0	23.9	0.0	16.1	43.9	0.0	25.1
Incr Delay (d2), s/veh	5.3	0.0	10.6	2.0	0.0	0.0	1.1	0.0	5.6	10.1	0.0	2.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.3	0.0	11.4	3.3	0.0	0.0	0.8	0.0	8.4	4.6	0.0	10.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	26.7	0.0	28.5	14.8	0.0	0.0	25.0	0.0	21.7	54.0	0.0	27.4
LnGrp LOS	C	A	C	B	A	A	C	A	C	D	A	C
Approach Vol, veh/h		729			247			583			688	
Approach Delay, s/veh		28.2			14.8			22.0			34.3	
Approach LOS		C			B			C			C	

Timer - Assigned Phs	2	4	6	8
Phs Duration (G+Y+Rc), s	40.0	40.0	40.0	40.0
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	35.0	35.0	35.0	35.0
Max Q Clear Time (g_c+I1), s	25.6	32.7	40.5	32.6
Green Ext Time (p_c), s	2.8	1.1	0.0	0.3

Intersection Summary	
HCM 6th Ctrl Delay	27.0
HCM 6th LOS	C

3: Pine Street & W Front Street Performance by movement

Movement	EBR	WBL	WBT	NBL	NBT	All
Denied Del/Veh (s)	37.2	0.0	1.0	2.0	0.0	16.3
Total Del/Veh (s)	13.8	87.0	19.6	23.6	4.2	24.4

3: Pine Street & W Front Street Performance by approach

Approach	EB	WB	NB	All
Denied Del/Veh (s)	37.2	0.8	1.8	16.3
Total Del/Veh (s)	13.8	36.8	22.4	24.4

Intersection	
Int Delay, s/veh	29.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	141	106	161	54	104	537
Future Vol, veh/h	141	106	161	54	104	537
Conflicting Peds, #/hr	3	24	0	9	9	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	77	77	79	79	88	88
Heavy Vehicles, %	0	0	1	1	3	3
Mvmt Flow	183	138	204	68	118	610

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1096	271	0	0	281	0
Stage 1	247	-	-	-	-	-
Stage 2	849	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.13	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.227	-
Pot Cap-1 Maneuver	238	773	-	-	1276	-
Stage 1	799	-	-	-	-	-
Stage 2	423	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	202	749	-	-	1265	-
Mov Cap-2 Maneuver	202	-	-	-	-	-
Stage 1	792	-	-	-	-	-
Stage 2	363	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	117.9	0	1.3
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	294	1265	-
HCM Lane V/C Ratio	-	-	1.091	0.093	-
HCM Control Delay (s)	-	-	117.9	8.1	0
HCM Lane LOS	-	-	F	A	A
HCM 95th %tile Q(veh)	-	-	12.8	0.3	-

Intersection	
Int Delay, s/veh	11.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	15	9	144	0	0	0	21	462	59	34	420	52
Future Vol, veh/h	15	9	144	0	0	0	21	462	59	34	420	52
Conflicting Peds, #/hr	5	0	21	21	0	5	98	0	74	74	0	98
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	62	62	62	92	92	92	93	93	93	88	88	88
Heavy Vehicles, %	0	0	0	2	2	2	3	3	3	1	1	1
Mvmt Flow	24	15	232	0	0	0	23	497	63	39	477	59

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1263	1363	626	1378	1361	608	634	0	0	634	0	0
Stage 1	683	683	-	649	649	-	-	-	-	-	-	-
Stage 2	580	680	-	729	712	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.12	6.52	6.22	4.13	-	-	4.11	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.518	4.018	3.318	2.227	-	-	2.209	-	-
Pot Cap-1 Maneuver	148	149	488	122	148	496	944	-	-	954	-	-
Stage 1	442	452	-	458	466	-	-	-	-	-	-	-
Stage 2	504	454	-	414	436	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	123	113	434	43	112	459	856	-	-	887	-	-
Mov Cap-2 Maneuver	123	113	-	43	112	-	-	-	-	-	-	-
Stage 1	385	384	-	409	417	-	-	-	-	-	-	-
Stage 2	482	406	-	170	371	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	58.6	0	0.4	0.6
HCM LOS	F	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	856	-	-	315	-	887	-	-
HCM Lane V/C Ratio	0.026	-	-	0.86	-	0.044	-	-
HCM Control Delay (s)	9.3	0	-	58.6	0	9.2	0	-
HCM Lane LOS	A	A	-	F	A	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	7.7	-	0.1	-	-

Intersection	
Int Delay, s/veh	8.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	62	129	62	11	207	106
Future Vol, veh/h	62	129	62	11	207	106
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	67	140	67	12	225	115

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	207	0	283	137
Stage 1	-	-	-	-	137	-
Stage 2	-	-	-	-	146	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1364	-	707	911
Stage 1	-	-	-	-	890	-
Stage 2	-	-	-	-	881	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1364	-	672	911
Mov Cap-2 Maneuver	-	-	-	-	672	-
Stage 1	-	-	-	-	890	-
Stage 2	-	-	-	-	838	-

Approach	EB	WB	NB
HCM Control Delay, s	0	6.6	14
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	738	-	-	1364	-
HCM Lane V/C Ratio	0.461	-	-	0.049	-
HCM Control Delay (s)	14	-	-	7.8	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	2.4	-	-	0.2	-

Intersection: 1: S Union Street/N Union Street & W Front Street/E Front Street

Movement	WB	WB	WB	NB	NB	SB	SB
Directions Served	LT	T	R	L	T	T	R
Maximum Queue (ft)	354	280	75	125	178	277	166
Average Queue (ft)	168	137	50	94	117	155	75
95th Queue (ft)	351	336	90	140	184	311	260
Link Distance (ft)	373	373			154	294	294
Upstream Blk Time (%)	7	11			8	18	12
Queuing Penalty (veh)	0	0			40	0	0
Storage Bay Dist (ft)			50	100			
Storage Blk Time (%)		22	5	16	9		
Queuing Penalty (veh)		32	7	50	14		

Intersection: 2: S Union Street & W State Street/E State Street

Movement	EB	EB	B7	WB	NB	NB	SB	SB
Directions Served	L	TR	T	LTR	L	TR	L	TR
Maximum Queue (ft)	125	587	62	324	219	232	126	200
Average Queue (ft)	77	306	4	136	48	188	106	157
95th Queue (ft)	154	566	35	302	144	251	158	218
Link Distance (ft)		520	146	356	200	200		154
Upstream Blk Time (%)		3	0	8	2	23		30
Queuing Penalty (veh)		23	0	0	0	0		176
Storage Bay Dist (ft)	100						100	
Storage Blk Time (%)	3	39					36	29
Queuing Penalty (veh)	17	40					156	43

Intersection: 3: Pine Street & W Front Street

Movement	EB	WB	WB	NB
Directions Served	R	L	T	L
Maximum Queue (ft)	224	309	302	172
Average Queue (ft)	86	113	125	94
95th Queue (ft)	244	313	307	162
Link Distance (ft)	331	512	512	165
Upstream Blk Time (%)	9	5	6	2
Queuing Penalty (veh)	0	12	13	7
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 4: Pine Street & Alley

Movement	WB	NB	B7	SB
Directions Served	LR	TR	T	LT
Maximum Queue (ft)	240	122	62	176
Average Queue (ft)	113	18	4	65
95th Queue (ft)	239	91	40	162
Link Distance (ft)	237	146	520	165
Upstream Blk Time (%)	3	3		10
Queuing Penalty (veh)	8	6		61
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 5: S Union Street & Alley

Movement	EB	NB	SB
Directions Served	LTR	LTR	LTR
Maximum Queue (ft)	239	166	167
Average Queue (ft)	164	66	105
95th Queue (ft)	298	168	202
Link Distance (ft)	228	154	154
Upstream Blk Time (%)	37	7	15
Queuing Penalty (veh)	62	38	79
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

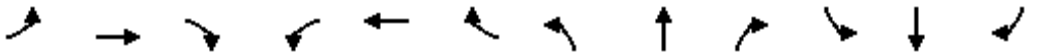
Intersection: 6: Parking Structure & Alley

Movement	EB	WB	NB
Directions Served	TR	LT	LR
Maximum Queue (ft)	186	40	163
Average Queue (ft)	63	10	106
95th Queue (ft)	210	34	177
Link Distance (ft)	237	228	126
Upstream Blk Time (%)	11		48
Queuing Penalty (veh)	16		0
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Zone Summary

Zone wide Queuing Penalty: 900

Appendix 6



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	98	249	47	221	169	0	0	197	72
Future Volume (veh/h)	0	0	0	98	249	47	221	169	0	0	197	72
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		0.95	0.99		1.00	1.00		0.98
Parking Bus, Adj				0.85	1.00	0.85	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach					No			No			No	
Adj Sat Flow, veh/h/ln				1796	1796	1796	1826	1826	0	0	1826	1826
Adj Flow Rate, veh/h				111	283	53	307	235	0	0	240	88
Peak Hour Factor				0.88	0.88	0.88	0.72	0.72	0.72	0.82	0.82	0.82
Percent Heavy Veh, %				7	7	7	5	5	0	0	5	5
Cap, veh/h				426	1169	617	522	913	0	0	913	761
Arrive On Green				0.44	0.50	0.50	0.17	0.17	0.00	0.00	0.50	0.50
Sat Flow, veh/h				852	2339	1234	1018	1826	0	0	1826	1521
Grp Volume(v), veh/h				193	201	53	307	235	0	0	240	88
Grp Sat Flow(s),veh/h/ln				1484	1706	1234	1018	1826	0	0	1826	1521
Q Serve(g_s), s				6.4	5.3	1.8	23.0	9.0	0.0	0.0	6.1	2.5
Cycle Q Clear(g_c), s				6.4	5.3	1.8	29.1	9.0	0.0	0.0	6.1	2.5
Prop In Lane				0.57		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				742	853	617	522	913	0	0	913	761
V/C Ratio(X)				0.26	0.24	0.09	0.59	0.26	0.00	0.00	0.26	0.12
Avail Cap(c_a), veh/h				742	853	617	522	913	0	0	913	761
HCM Platoon Ratio				1.00	1.00	1.00	0.33	0.33	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	1.00
Uniform Delay (d), s/veh				12.4	11.3	10.4	31.7	20.4	0.0	0.0	11.5	10.6
Incr Delay (d2), s/veh				0.9	0.6	0.3	4.8	0.7	0.0	0.0	0.7	0.3
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				2.2	2.1	0.5	6.9	4.4	0.0	0.0	2.5	0.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				13.3	12.0	10.7	36.5	21.1	0.0	0.0	12.2	10.9
LnGrp LOS				B	B	B	D	C	A	A	B	B
Approach Vol, veh/h					447			542			328	
Approach Delay, s/veh					12.4			29.9			11.9	
Approach LOS					B			C			B	

Timer - Assigned Phs	2			6		8					
Phs Duration (G+Y+Rc), s	40.0			40.0		40.0					
Change Period (Y+Rc), s	5.0			5.0		5.0					
Max Green Setting (Gmax), s	35.0			35.0		35.0					
Max Q Clear Time (g_c+I1), s	31.1			8.1		8.4					
Green Ext Time (p_c), s	1.1			1.8		2.8					

Intersection Summary												
HCM 6th Ctrl Delay		19.5										
HCM 6th LOS		B										



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	93	272	91	0	0	0	0	337	75	53	193	0
Future Volume (veh/h)	93	272	91	0	0	0	0	337	75	53	193	0
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97				1.00		0.99	1.00		1.00
Parking Bus, Adj	0.85	1.00	0.85				1.00	1.00	0.85	1.00	1.00	1.00
Work Zone On Approach		No						No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856				0	1856	1856	1856	1856	0
Adj Flow Rate, veh/h	111	324	108				0	438	97	62	227	0
Peak Hour Factor	0.84	0.84	0.84				0.77	0.77	0.77	0.85	0.85	0.85
Percent Heavy Veh, %	3	3	3				0	3	3	3	3	0
Cap, veh/h	294	891	311				0	928	579	387	928	0
Arrive On Green	0.44	0.50	0.44				0.00	0.50	0.44	0.17	0.17	0.00
Sat Flow, veh/h	589	1783	621				0	1856	1323	860	1856	0
Grp Volume(v), veh/h	292	0	251				0	438	97	62	227	0
Grp Sat Flow(s),veh/h/ln	1548	0	1445				0	1856	1323	860	1856	0
Q Serve(g_s), s	9.6	0.0	8.8				0.0	12.4	3.6	5.2	8.5	0.0
Cycle Q Clear(g_c), s	9.6	0.0	8.8				0.0	12.4	3.6	17.6	8.5	0.0
Prop In Lane	0.38		0.43				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	774	0	722				0	928	579	387	928	0
V/C Ratio(X)	0.38	0.00	0.35				0.00	0.47	0.17	0.16	0.24	0.00
Avail Cap(c_a), veh/h	774	0	722				0	928	579	387	928	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	0.33	0.33	1.00
Upstream Filter(I)	1.00	0.00	1.00				0.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	13.0	0.0	12.8				0.0	13.1	13.7	29.7	20.3	0.0
Incr Delay (d2), s/veh	1.4	0.0	1.3				0.0	1.7	0.6	0.9	0.6	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.5	0.0	3.0				0.0	5.3	1.1	1.3	4.2	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	14.4	0.0	14.2				0.0	14.8	14.3	30.5	20.9	0.0
LnGrp LOS	B	A	B				A	B	B	C	C	A
Approach Vol, veh/h		543						535			289	
Approach Delay, s/veh		14.3						14.7			23.0	
Approach LOS		B						B			C	

Timer - Assigned Phs	2	4	6
Phs Duration (G+Y+Rc), s	40.0	40.0	40.0
Change Period (Y+Rc), s	5.0	5.0	5.0
Max Green Setting (Gmax), s	35.0	35.0	35.0
Max Q Clear Time (g_c+I1), s	14.4	11.6	19.6
Green Ext Time (p_c), s	3.2	3.7	1.5

Intersection Summary	
HCM 6th Ctrl Delay	16.3
HCM 6th LOS	B

Intersection	
Int Delay, s/veh	10.6

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	109	0	0	0	205	347
Future Vol, veh/h	109	0	0	0	205	347
Conflicting Peds, #/hr	4	1	0	6	6	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	60	60	94	94	94	94
Heavy Vehicles, %	29	29	4	4	3	3
Mvmt Flow	182	0	0	0	218	369

Major/Minor	Minor1		Major2	
Conflicting Flow All	631	-	6	0
Stage 1	6	-	-	-
Stage 2	625	-	-	-
Critical Hdwy	7.38	-	4.16	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	6.38	-	-	-
Follow-up Hdwy	3.79	-	2.23	-
Pot Cap-1 Maneuver	357	0	1606	-
Stage 1	-	0	-	-
Stage 2	428	0	-	-
Platoon blocked, %				-
Mov Cap-1 Maneuver	294	-	1597	-
Mov Cap-2 Maneuver	294	-	-	-
Stage 1	-	-	-	-
Stage 2	354	-	-	-

Approach	WB	SB
HCM Control Delay, s	35.2	3
HCM LOS	E	

Minor Lane/Major Mvmt	WBLn1	SBL	SBT
Capacity (veh/h)	294	1597	-
HCM Lane V/C Ratio	0.618	0.137	-
HCM Control Delay (s)	35.2	7.6	0.3
HCM Lane LOS	E	A	A
HCM 95th %tile Q(veh)	3.8	0.5	-

Intersection	
Int Delay, s/veh	1.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		⇕			⇕			⇕			⇕	
Traffic Vol, veh/h	16	4	22	0	0	0	45	374	11	12	224	59
Future Vol, veh/h	16	4	22	0	0	0	45	374	11	12	224	59
Conflicting Peds, #/hr	5	0	5	5	0	5	15	0	10	10	0	15
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	71	71	71	92	92	92	86	86	86	70	70	70
Heavy Vehicles, %	0	0	0	2	2	2	2	2	2	3	3	3
Mvmt Flow	23	6	31	0	0	0	52	435	13	17	320	84

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	962	973	382	976	1009	457	419	0	0	458	0	0
Stage 1	411	411	-	556	556	-	-	-	-	-	-	-
Stage 2	551	562	-	420	453	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.12	6.52	6.22	4.12	-	-	4.13	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.518	4.018	3.318	2.218	-	-	2.227	-	-
Pot Cap-1 Maneuver	237	254	670	230	240	604	1140	-	-	1098	-	-
Stage 1	622	598	-	515	513	-	-	-	-	-	-	-
Stage 2	522	513	-	611	570	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	218	228	657	199	215	595	1124	-	-	1088	-	-
Mov Cap-2 Maneuver	218	228	-	199	215	-	-	-	-	-	-	-
Stage 1	575	578	-	478	477	-	-	-	-	-	-	-
Stage 2	487	477	-	562	551	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	17.9	0	0.9	0.3
HCM LOS	C	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1124	-	-	338	-	1088	-	-
HCM Lane V/C Ratio	0.047	-	-	0.175	-	0.016	-	-
HCM Control Delay (s)	8.4	0	-	17.9	0	8.4	0	-
HCM Lane LOS	A	A	-	C	A	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0.6	-	0	-	-

Intersection	
Int Delay, s/veh	5.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	22	168	92	12	101	20
Future Vol, veh/h	22	168	92	12	101	20
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	24	183	100	13	110	22

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	207	0	329	116
Stage 1	-	-	-	-	116	-
Stage 2	-	-	-	-	213	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1364	-	665	936
Stage 1	-	-	-	-	909	-
Stage 2	-	-	-	-	823	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1364	-	616	936
Mov Cap-2 Maneuver	-	-	-	-	616	-
Stage 1	-	-	-	-	909	-
Stage 2	-	-	-	-	762	-

Approach	EB	WB	NB
HCM Control Delay, s	0	6.9	11.9
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	653	-	-	1364	-
HCM Lane V/C Ratio	0.201	-	-	0.073	-
HCM Control Delay (s)	11.9	-	-	7.8	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.7	-	-	0.2	-

Intersection: 1: S Union Street/N Union Street & W Front Street/E Front Street

Movement	WB	WB	WB	NB	NB	SB	SB
Directions Served	LT	T	R	L	T	T	R
Maximum Queue (ft)	170	194	74	126	202	175	77
Average Queue (ft)	79	69	25	108	120	73	26
95th Queue (ft)	140	145	66	143	209	138	57
Link Distance (ft)	373	373			154	293	293
Upstream Blk Time (%)					11		
Queuing Penalty (veh)					46		
Storage Bay Dist (ft)			50	100			
Storage Blk Time (%)		16	0	29	10		
Queuing Penalty (veh)		8	0	52	24		

Intersection: 2: S Union Street & W State Street/E State Street

Movement	EB	EB	NB	NB	SB	SB
Directions Served	LT	TR	T	R	L	T
Maximum Queue (ft)	135	150	229	91	117	166
Average Queue (ft)	67	74	126	29	41	89
95th Queue (ft)	114	128	211	79	95	158
Link Distance (ft)	525	525	195	195		159
Upstream Blk Time (%)			4	1		1
Queuing Penalty (veh)			0	0		2
Storage Bay Dist (ft)					100	
Storage Blk Time (%)					1	5
Queuing Penalty (veh)					2	3

Intersection: 3: Pine Street & W Front Street

Movement	WB	WB
Directions Served	L	T
Maximum Queue (ft)	56	76
Average Queue (ft)	5	10
95th Queue (ft)	29	47
Link Distance (ft)	526	526
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 4: Pine Street & Alley

Movement	WB	SB	SB
Directions Served	L	LT	T
Maximum Queue (ft)	127	49	11
Average Queue (ft)	54	4	0
95th Queue (ft)	98	26	6
Link Distance (ft)	247	164	164
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 5: S Union Street & Alley

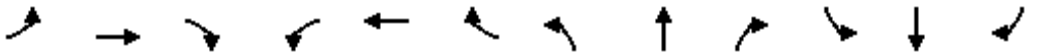
Movement	EB	NB	SB
Directions Served	LTR	LTR	LTR
Maximum Queue (ft)	88	162	92
Average Queue (ft)	29	43	12
95th Queue (ft)	65	127	57
Link Distance (ft)	228	159	154
Upstream Blk Time (%)		2	0
Queuing Penalty (veh)		12	0
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 6: Parking Stucture & Alley

Movement	EB	WB	NB
Directions Served	TR	LT	LR
Maximum Queue (ft)	17	59	92
Average Queue (ft)	1	15	40
95th Queue (ft)	8	47	69
Link Distance (ft)	247	228	126
Upstream Blk Time (%)			0
Queuing Penalty (veh)			0
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Zone Summary

Zone wide Queuing Penalty: 148



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	161	439	117	308	327	0	0	271	75
Future Volume (veh/h)	0	0	0	161	439	117	308	327	0	0	271	75
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		0.89	0.99		1.00	1.00		0.97
Parking Bus, Adj				0.85	1.00	0.85	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach					No			No			No	
Adj Sat Flow, veh/h/ln				1856	1856	1856	1870	1870	0	0	1841	1841
Adj Flow Rate, veh/h				185	505	134	346	367	0	0	339	94
Peak Hour Factor				0.87	0.87	0.87	0.89	0.89	0.89	0.80	0.80	0.80
Percent Heavy Veh, %				3	3	3	2	2	0	0	4	4
Cap, veh/h				421	1228	593	455	935	0	0	920	756
Arrive On Green				0.44	0.50	0.50	1.00	1.00	0.00	0.00	0.50	0.50
Sat Flow, veh/h				841	2456	1186	943	1870	0	0	1841	1511
Grp Volume(v), veh/h				338	352	134	346	367	0	0	339	94
Grp Sat Flow(s),veh/h/ln				1535	1763	1186	943	1870	0	0	1841	1511
Q Serve(g_s), s				11.8	10.0	5.1	24.9	0.0	0.0	0.0	9.0	2.7
Cycle Q Clear(g_c), s				11.8	10.0	5.1	33.9	0.0	0.0	0.0	9.0	2.7
Prop In Lane				0.55		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				768	881	593	455	935	0	0	920	756
V/C Ratio(X)				0.44	0.40	0.23	0.76	0.39	0.00	0.00	0.37	0.12
Avail Cap(c_a), veh/h				768	881	593	455	935	0	0	920	756
HCM Platoon Ratio				1.00	1.00	1.00	2.00	2.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	1.00
Uniform Delay (d), s/veh				13.8	12.5	11.3	3.8	0.0	0.0	0.0	12.3	10.7
Incr Delay (d2), s/veh				1.8	1.4	0.9	11.4	1.2	0.0	0.0	1.1	0.3
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				4.4	4.0	1.4	1.4	0.3	0.0	0.0	3.8	0.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				15.7	13.9	12.2	15.2	1.2	0.0	0.0	13.4	11.0
LnGrp LOS				B	B	B	B	A	A	A	B	B
Approach Vol, veh/h					824			713			433	
Approach Delay, s/veh					14.3			8.0			12.9	
Approach LOS					B			A			B	

Timer - Assigned Phs	2			6		8			
Phs Duration (G+Y+Rc), s	40.0			40.0		40.0			
Change Period (Y+Rc), s	5.0			5.0		5.0			
Max Green Setting (Gmax), s	35.0			35.0		35.0			
Max Q Clear Time (g_c+I1), s	35.9			11.0		13.8			
Green Ext Time (p_c), s	0.0			2.5		5.2			

Intersection Summary		
HCM 6th Ctrl Delay	11.7	
HCM 6th LOS	B	



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	201	509	170	0	0	0	0	464	144	118	313	0
Future Volume (veh/h)	201	509	170	0	0	0	0	464	144	118	313	0
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.96				1.00		0.98	1.00		1.00
Parking Bus, Adj	0.85	1.00	0.85				1.00	1.00	0.85	1.00	1.00	1.00
Work Zone On Approach		No						No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856				0	1870	1870	1885	1885	0
Adj Flow Rate, veh/h	216	547	183				0	494	153	144	382	0
Peak Hour Factor	0.93	0.93	0.93				0.94	0.94	0.94	0.82	0.82	0.82
Percent Heavy Veh, %	3	3	3				0	2	2	1	1	0
Cap, veh/h	326	862	303				0	935	577	342	943	0
Arrive On Green	0.44	0.50	0.44				0.00	0.50	0.44	1.00	1.00	0.00
Sat Flow, veh/h	651	1723	606				0	1870	1320	786	1885	0
Grp Volume(v), veh/h	513	0	433				0	494	153	144	382	0
Grp Sat Flow(s),veh/h/ln	1545	0	1436				0	1870	1320	786	1885	0
Q Serve(g_s), s	20.4	0.0	17.8				0.0	14.4	5.9	8.3	0.0	0.0
Cycle Q Clear(g_c), s	20.4	0.0	17.8				0.0	14.4	5.9	22.7	0.0	0.0
Prop In Lane	0.42		0.42				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	772	0	718				0	935	577	342	943	0
V/C Ratio(X)	0.66	0.00	0.60				0.00	0.53	0.27	0.42	0.41	0.00
Avail Cap(c_a), veh/h	772	0	718				0	935	577	342	943	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	2.00	2.00	1.00
Upstream Filter(I)	1.00	0.00	1.00				0.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	15.9	0.0	15.2				0.0	13.6	14.3	4.1	0.0	0.0
Incr Delay (d2), s/veh	4.5	0.0	3.7				0.0	2.1	1.1	3.8	1.3	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	7.8	0.0	6.3				0.0	6.2	1.9	1.0	0.3	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	20.4	0.0	19.0				0.0	15.7	15.4	7.8	1.3	0.0
LnGrp LOS	C	A	B				A	B	B	A	A	A
Approach Vol, veh/h		946						647			526	
Approach Delay, s/veh		19.7						15.7			3.1	
Approach LOS		B						B			A	

Timer - Assigned Phs	2	4	6
Phs Duration (G+Y+Rc), s	40.0	40.0	40.0
Change Period (Y+Rc), s	5.0	5.0	5.0
Max Green Setting (Gmax), s	35.0	35.0	35.0
Max Q Clear Time (g_c+I1), s	16.4	22.4	24.7
Green Ext Time (p_c), s	3.8	5.3	2.5

Intersection Summary	
HCM 6th Ctrl Delay	14.3
HCM 6th LOS	B

Intersection	
Int Delay, s/veh	61.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	296	0	0	0	165	584
Future Vol, veh/h	296	0	0	0	165	584
Conflicting Peds, #/hr	3	24	0	9	9	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	77	77	79	79	88	88
Heavy Vehicles, %	0	0	1	1	3	3
Mvmt Flow	384	0	0	0	188	664

Major/Minor	Minor1		Major2	
Conflicting Flow All	720	-	9	0
Stage 1	9	-	-	-
Stage 2	711	-	-	-
Critical Hdwy	6.8	-	4.16	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	5.8	-	-	-
Follow-up Hdwy	3.5	-	2.23	-
Pot Cap-1 Maneuver	~ 367	0	1602	-
Stage 1	-	0	-	-
Stage 2	453	0	-	-
Platoon blocked, %				-
Mov Cap-1 Maneuver	~ 295	-	1588	-
Mov Cap-2 Maneuver	~ 295	-	-	-
Stage 1	-	-	-	-
Stage 2	~ 368	-	-	-

Approach	WB	SB
HCM Control Delay, s	194.1	2.1
HCM LOS	F	

Minor Lane/Major Mvmt	WBLn1	SBL	SBT
Capacity (veh/h)	295	1588	-
HCM Lane V/C Ratio	1.303	0.118	-
HCM Control Delay (s)	194.1	7.6	0.5
HCM Lane LOS	F	A	A
HCM 95th %tile Q(veh)	18.8	0.4	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Intersection	
Int Delay, s/veh	4.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		⇕			⇕			⇕			⇕	
Traffic Vol, veh/h	10	10	82	0	0	0	8	625	32	37	349	46
Future Vol, veh/h	10	10	82	0	0	0	8	625	32	37	349	46
Conflicting Peds, #/hr	5	0	21	21	0	5	98	0	74	74	0	98
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	62	62	62	92	92	92	93	93	93	88	88	88
Heavy Vehicles, %	0	0	0	2	2	2	3	3	3	1	1	1
Mvmt Flow	16	16	132	0	0	0	9	672	34	42	397	52

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1317	1403	542	1383	1412	768	547	0	0	780	0	0
Stage 1	605	605	-	781	781	-	-	-	-	-	-	-
Stage 2	712	798	-	602	631	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.12	6.52	6.22	4.13	-	-	4.11	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.518	4.018	3.318	2.227	-	-	2.209	-	-
Pot Cap-1 Maneuver	136	141	544	121	138	402	1017	-	-	842	-	-
Stage 1	488	491	-	388	405	-	-	-	-	-	-	-
Stage 2	427	401	-	486	474	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	115	109	483	66	106	372	922	-	-	783	-	-
Mov Cap-2 Maneuver	115	109	-	66	106	-	-	-	-	-	-	-
Stage 1	435	413	-	355	371	-	-	-	-	-	-	-
Stage 2	418	367	-	308	399	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	31.9	0	0.1	0.8
HCM LOS	D	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	922	-	-	293	-	783	-	-
HCM Lane V/C Ratio	0.009	-	-	0.561	-	0.054	-	-
HCM Control Delay (s)	8.9	0	-	31.9	0	9.9	0	-
HCM Lane LOS	A	A	-	D	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	3.2	-	0.2	-	-

Intersection	
Int Delay, s/veh	8.3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	41	146	45	9	252	61
Future Vol, veh/h	41	146	45	9	252	61
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	45	159	49	10	274	66

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	204	0	233	125
Stage 1	-	-	-	-	125	-
Stage 2	-	-	-	-	108	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1368	-	755	926
Stage 1	-	-	-	-	901	-
Stage 2	-	-	-	-	916	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1368	-	728	926
Mov Cap-2 Maneuver	-	-	-	-	728	-
Stage 1	-	-	-	-	901	-
Stage 2	-	-	-	-	883	-

Approach	EB	WB	NB
HCM Control Delay, s	0	6.4	13.5
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	760	-	-	1368	-
HCM Lane V/C Ratio	0.448	-	-	0.036	-
HCM Control Delay (s)	13.5	-	-	7.7	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	2.3	-	-	0.1	-

Intersection: 1: S Union Street/N Union Street & W Front Street/E Front Street

Movement	WB	WB	WB	NB	NB	SB	SB
Directions Served	LT	T	R	L	T	T	R
Maximum Queue (ft)	264	294	75	125	217	242	120
Average Queue (ft)	132	144	45	120	174	117	29
95th Queue (ft)	225	252	90	139	228	210	78
Link Distance (ft)	373	373			154	293	293
Upstream Blk Time (%)	0	0			24	1	0
Queuing Penalty (veh)	0	0			153	0	0
Storage Bay Dist (ft)			50	100			
Storage Blk Time (%)		32	2	41	15		
Queuing Penalty (veh)		37	5	139	47		

Intersection: 2: S Union Street & W State Street/E State Street

Movement	EB	EB	NB	NB	SB	SB
Directions Served	LT	TR	T	R	L	T
Maximum Queue (ft)	256	239	237	212	125	188
Average Queue (ft)	149	150	202	70	87	124
95th Queue (ft)	225	222	253	188	139	193
Link Distance (ft)	525	525	195	195		159
Upstream Blk Time (%)			57	5		7
Queuing Penalty (veh)			0	0		35
Storage Bay Dist (ft)					100	
Storage Blk Time (%)					15	17
Queuing Penalty (veh)					50	20

Intersection: 3: Pine Street & W Front Street

Movement	EB	WB	WB
Directions Served	R	L	T
Maximum Queue (ft)	48	73	102
Average Queue (ft)	2	18	18
95th Queue (ft)	35	54	65
Link Distance (ft)	324	526	526
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 4: Pine Street & Alley

Movement	WB	SB	SB
Directions Served	L	LT	T
Maximum Queue (ft)	199	104	110
Average Queue (ft)	84	19	11
95th Queue (ft)	163	68	67
Link Distance (ft)	248	176	176
Upstream Blk Time (%)	0	0	1
Queuing Penalty (veh)	0	0	2
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 5: S Union Street & Alley

Movement	EB	NB	SB
Directions Served	LTR	LTR	LTR
Maximum Queue (ft)	213	173	165
Average Queue (ft)	75	141	73
95th Queue (ft)	185	218	166
Link Distance (ft)	228	159	154
Upstream Blk Time (%)	6	14	2
Queuing Penalty (veh)	6	98	12
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

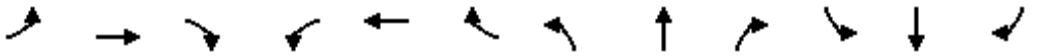
Intersection: 6: Parking Structure & Alley

Movement	EB	WB	NB
Directions Served	TR	LT	LR
Maximum Queue (ft)	126	53	147
Average Queue (ft)	12	11	73
95th Queue (ft)	87	37	124
Link Distance (ft)	248	228	126
Upstream Blk Time (%)	1		8
Queuing Penalty (veh)	1		0
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Zone Summary

Zone wide Queuing Penalty: 605

Appendix 7



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	98	249	47	221	169	0	0	197	72
Future Volume (veh/h)	0	0	0	98	249	47	221	169	0	0	197	72
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		0.95	0.99		1.00	1.00		0.98
Parking Bus, Adj				0.85	1.00	0.85	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach					No			No			No	
Adj Sat Flow, veh/h/ln				1796	1796	1796	1826	1826	0	0	1826	1826
Adj Flow Rate, veh/h				111	283	53	307	235	0	0	240	88
Peak Hour Factor				0.88	0.88	0.88	0.72	0.72	0.72	0.82	0.82	0.82
Percent Heavy Veh, %				7	7	7	5	5	0	0	5	5
Cap, veh/h				362	994	520	695	1050	0	0	776	645
Arrive On Green				0.36	0.43	0.43	0.25	0.96	0.00	0.00	0.43	0.43
Sat Flow, veh/h				852	2339	1224	1739	1826	0	0	1826	1517
Grp Volume(v), veh/h				193	201	53	307	235	0	0	240	88
Grp Sat Flow(s),veh/h/ln				1484	1706	1224	1739	1826	0	0	1826	1517
Q Serve(g_s), s				7.2	6.1	2.1	7.1	0.5	0.0	0.0	7.0	2.8
Cycle Q Clear(g_c), s				7.2	6.1	2.1	7.1	0.5	0.0	0.0	7.0	2.8
Prop In Lane				0.57		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				631	725	520	695	1050	0	0	776	645
V/C Ratio(X)				0.31	0.28	0.10	0.44	0.22	0.00	0.00	0.31	0.14
Avail Cap(c_a), veh/h				631	725	520	695	1050	0	0	776	645
HCM Platoon Ratio				1.00	1.00	1.00	1.67	1.67	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	1.00
Uniform Delay (d), s/veh				16.3	15.0	13.8	7.5	0.7	0.0	0.0	15.2	14.0
Incr Delay (d2), s/veh				1.3	0.9	0.4	2.0	0.5	0.0	0.0	1.0	0.4
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				2.6	2.5	0.6	2.4	0.3	0.0	0.0	3.0	1.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				17.5	15.9	14.2	9.5	1.2	0.0	0.0	16.3	14.5
LnGrp LOS				B	B	B	A	A	A	A	B	B
Approach Vol, veh/h					447			542			328	
Approach Delay, s/veh					16.4			5.9			15.8	
Approach LOS					B			A			B	

Timer - Assigned Phs		2			5	6		8				
Phs Duration (G+Y+Rc), s		46.0			12.0	34.0		34.0				
Change Period (Y+Rc), s		5.0			5.0	5.0		5.0				
Max Green Setting (Gmax), s		41.0			7.0	29.0		29.0				
Max Q Clear Time (g_c+I1), s		2.5			9.1	9.0		9.2				
Green Ext Time (p_c), s		1.6			0.0	1.7		2.6				

Intersection Summary												
HCM 6th Ctrl Delay			11.9									
HCM 6th LOS			B									

Notes

User approved pedestrian interval to be less than phase max green.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	93	272	91	0	0	0	0	337	75	53	193	0
Future Volume (veh/h)	93	272	91	0	0	0	0	337	75	53	193	0
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97				1.00		0.99	1.00		1.00
Parking Bus, Adj	0.85	1.00	0.85				1.00	1.00	0.85	1.00	1.00	1.00
Work Zone On Approach		No						No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856				0	1856	1856	1856	1856	0
Adj Flow Rate, veh/h	111	324	108				0	438	97	62	227	0
Peak Hour Factor	0.84	0.84	0.84				0.77	0.77	0.77	0.85	0.85	0.85
Percent Heavy Veh, %	3	3	3				0	3	3	3	3	0
Cap, veh/h	294	891	311				0	928	579	387	928	0
Arrive On Green	0.44	0.50	0.44				0.00	0.50	0.44	1.00	1.00	0.00
Sat Flow, veh/h	589	1783	621				0	1856	1323	860	1856	0
Grp Volume(v), veh/h	292	0	251				0	438	97	62	227	0
Grp Sat Flow(s),veh/h/ln	1548	0	1445				0	1856	1323	860	1856	0
Q Serve(g_s), s	9.6	0.0	8.8				0.0	12.4	3.6	2.1	0.0	0.0
Cycle Q Clear(g_c), s	9.6	0.0	8.8				0.0	12.4	3.6	14.4	0.0	0.0
Prop In Lane	0.38		0.43				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	774	0	722				0	928	579	387	928	0
V/C Ratio(X)	0.38	0.00	0.35				0.00	0.47	0.17	0.16	0.24	0.00
Avail Cap(c_a), veh/h	774	0	722				0	928	579	387	928	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	2.00	2.00	1.00
Upstream Filter(I)	1.00	0.00	1.00				0.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	13.0	0.0	12.8				0.0	13.1	13.7	2.2	0.0	0.0
Incr Delay (d2), s/veh	1.4	0.0	1.3				0.0	1.7	0.6	0.9	0.6	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.5	0.0	3.0				0.0	5.3	1.1	0.2	0.2	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	14.4	0.0	14.2				0.0	14.8	14.3	3.1	0.6	0.0
LnGrp LOS	B	A	B				A	B	B	A	A	A
Approach Vol, veh/h		543						535			289	
Approach Delay, s/veh		14.3						14.7			1.2	
Approach LOS		B						B			A	

Timer - Assigned Phs	2	4	6
Phs Duration (G+Y+Rc), s	40.0	40.0	40.0
Change Period (Y+Rc), s	5.0	5.0	5.0
Max Green Setting (Gmax), s	35.0	35.0	35.0
Max Q Clear Time (g_c+I1), s	14.4	11.6	16.4
Green Ext Time (p_c), s	3.2	3.7	1.6

Intersection Summary	
HCM 6th Ctrl Delay	11.7
HCM 6th LOS	B

Intersection	
Int Delay, s/veh	10.6

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	109	0	0	0	205	347
Future Vol, veh/h	109	0	0	0	205	347
Conflicting Peds, #/hr	4	1	0	6	6	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	60	60	94	94	94	94
Heavy Vehicles, %	29	29	4	4	3	3
Mvmt Flow	182	0	0	0	218	369

Major/Minor	Minor1		Major2	
Conflicting Flow All	631	-	6	0
Stage 1	6	-	-	-
Stage 2	625	-	-	-
Critical Hdwy	7.38	-	4.16	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	6.38	-	-	-
Follow-up Hdwy	3.79	-	2.23	-
Pot Cap-1 Maneuver	357	0	1606	-
Stage 1	-	0	-	-
Stage 2	428	0	-	-
Platoon blocked, %				-
Mov Cap-1 Maneuver	294	-	1597	-
Mov Cap-2 Maneuver	294	-	-	-
Stage 1	-	-	-	-
Stage 2	354	-	-	-

Approach	WB	SB
HCM Control Delay, s	35.2	3
HCM LOS	E	

Minor Lane/Major Mvmt	WBLn1	SBL	SBT
Capacity (veh/h)	294	1597	-
HCM Lane V/C Ratio	0.618	0.137	-
HCM Control Delay (s)	35.2	7.6	0.3
HCM Lane LOS	E	A	A
HCM 95th %tile Q(veh)	3.8	0.5	-

Intersection	
Int Delay, s/veh	1.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		⇕			⇕			⇕			⇕	
Traffic Vol, veh/h	16	4	22	0	0	0	45	374	11	12	224	59
Future Vol, veh/h	16	4	22	0	0	0	45	374	11	12	224	59
Conflicting Peds, #/hr	5	0	5	5	0	5	15	0	10	10	0	15
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	71	71	71	92	92	92	86	86	86	70	70	70
Heavy Vehicles, %	0	0	0	2	2	2	2	2	2	3	3	3
Mvmt Flow	23	6	31	0	0	0	52	435	13	17	320	84

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	962	973	382	976	1009	457	419	0	0	458	0	0
Stage 1	411	411	-	556	556	-	-	-	-	-	-	-
Stage 2	551	562	-	420	453	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.12	6.52	6.22	4.12	-	-	4.13	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.518	4.018	3.318	2.218	-	-	2.227	-	-
Pot Cap-1 Maneuver	237	254	670	230	240	604	1140	-	-	1098	-	-
Stage 1	622	598	-	515	513	-	-	-	-	-	-	-
Stage 2	522	513	-	611	570	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	218	228	657	199	215	595	1124	-	-	1088	-	-
Mov Cap-2 Maneuver	218	228	-	199	215	-	-	-	-	-	-	-
Stage 1	575	578	-	478	477	-	-	-	-	-	-	-
Stage 2	487	477	-	562	551	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	17.9	0	0.9	0.3
HCM LOS	C	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1124	-	-	338	-	1088	-	-
HCM Lane V/C Ratio	0.047	-	-	0.175	-	0.016	-	-
HCM Control Delay (s)	8.4	0	-	17.9	0	8.4	0	-
HCM Lane LOS	A	A	-	C	A	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0.6	-	0	-	-

Intersection	
Int Delay, s/veh	5.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	22	168	92	12	101	20
Future Vol, veh/h	22	168	92	12	101	20
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	24	183	100	13	110	22

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	207	0	329	116
Stage 1	-	-	-	-	116	-
Stage 2	-	-	-	-	213	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1364	-	665	936
Stage 1	-	-	-	-	909	-
Stage 2	-	-	-	-	823	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1364	-	616	936
Mov Cap-2 Maneuver	-	-	-	-	616	-
Stage 1	-	-	-	-	909	-
Stage 2	-	-	-	-	762	-

Approach	EB	WB	NB
HCM Control Delay, s	0	6.9	11.9
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	653	-	-	1364	-
HCM Lane V/C Ratio	0.201	-	-	0.073	-
HCM Control Delay (s)	11.9	-	-	7.8	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.7	-	-	0.2	-

Intersection: 1: S Union Street/N Union Street & W Front Street/E Front Street

Movement	WB	WB	WB	NB	NB	SB	SB
Directions Served	LT	T	R	L	T	T	R
Maximum Queue (ft)	188	161	75	124	124	194	65
Average Queue (ft)	81	71	25	66	36	89	27
95th Queue (ft)	144	134	68	114	96	160	56
Link Distance (ft)	373	373			154	293	293
Upstream Blk Time (%)				0	0		
Queuing Penalty (veh)				0	0		
Storage Bay Dist (ft)			50	100			
Storage Blk Time (%)		19	0	3	0		
Queuing Penalty (veh)		9	0	6	1		

Intersection: 2: S Union Street & W State Street/E State Street

Movement	EB	EB	NB	NB	SB	SB
Directions Served	LT	TR	T	R	L	T
Maximum Queue (ft)	144	149	210	55	119	169
Average Queue (ft)	71	74	124	25	44	101
95th Queue (ft)	122	129	213	53	97	165
Link Distance (ft)	525	525	195	195		159
Upstream Blk Time (%)			2			2
Queuing Penalty (veh)			0			5
Storage Bay Dist (ft)					100	
Storage Blk Time (%)					1	10
Queuing Penalty (veh)					1	5

Intersection: 3: Pine Street & W Front Street

Movement	WB	WB
Directions Served	L	T
Maximum Queue (ft)	57	53
Average Queue (ft)	5	7
95th Queue (ft)	29	32
Link Distance (ft)	526	526
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 4: Pine Street & Alley

Movement	WB	SB	SB
Directions Served	L	LT	T
Maximum Queue (ft)	133	46	12
Average Queue (ft)	52	4	0
95th Queue (ft)	102	24	6
Link Distance (ft)	247	164	164
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 5: S Union Street & Alley

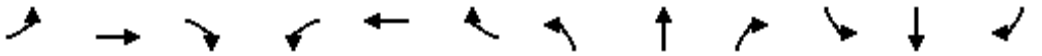
Movement	EB	NB	SB
Directions Served	LTR	LTR	LTR
Maximum Queue (ft)	72	109	86
Average Queue (ft)	27	18	12
95th Queue (ft)	53	66	49
Link Distance (ft)	228	159	154
Upstream Blk Time (%)		0	
Queuing Penalty (veh)		0	
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 6: Parking Stucture & Alley

Movement	EB	WB	NB
Directions Served	TR	LT	LR
Maximum Queue (ft)	9	62	84
Average Queue (ft)	0	15	40
95th Queue (ft)	4	48	68
Link Distance (ft)	247	228	126
Upstream Blk Time (%)			0
Queuing Penalty (veh)			0
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Zone Summary

Zone wide Queuing Penalty: 28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	161	439	117	308	327	0	0	271	75
Future Volume (veh/h)	0	0	0	161	439	117	308	327	0	0	271	75
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		0.87	0.98		1.00	1.00		0.96
Parking Bus, Adj				0.85	1.00	0.85	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach					No			No			No	
Adj Sat Flow, veh/h/ln				1856	1856	1856	1870	1870	0	0	1841	1841
Adj Flow Rate, veh/h				185	505	134	346	367	0	0	339	94
Peak Hour Factor				0.87	0.87	0.87	0.89	0.89	0.89	0.80	0.80	0.80
Percent Heavy Veh, %				3	3	3	2	2	0	0	4	4
Cap, veh/h				358	1044	493	552	1075	0	0	782	639
Arrive On Green				0.36	0.43	0.43	0.30	1.00	0.00	0.00	0.43	0.43
Sat Flow, veh/h				841	2456	1159	1781	1870	0	0	1841	1503
Grp Volume(v), veh/h				338	352	134	346	367	0	0	339	94
Grp Sat Flow(s),veh/h/ln				1535	1763	1159	1781	1870	0	0	1841	1503
Q Serve(g_s), s				13.4	11.5	6.0	0.0	0.0	0.0	0.0	10.4	3.1
Cycle Q Clear(g_c), s				13.4	11.5	6.0	0.0	0.0	0.0	0.0	10.4	3.1
Prop In Lane				0.55		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				652	749	493	552	1075	0	0	782	639
V/C Ratio(X)				0.52	0.47	0.27	0.63	0.34	0.00	0.00	0.43	0.15
Avail Cap(c_a), veh/h				652	749	493	552	1075	0	0	782	639
HCM Platoon Ratio				1.00	1.00	1.00	2.00	2.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	1.00
Uniform Delay (d), s/veh				18.1	16.5	15.0	19.1	0.0	0.0	0.0	16.2	14.1
Incr Delay (d2), s/veh				2.9	2.1	1.4	5.3	0.9	0.0	0.0	1.7	0.5
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				5.2	4.9	1.7	5.4	0.3	0.0	0.0	4.6	1.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				21.0	18.6	16.3	24.5	0.9	0.0	0.0	18.0	14.6
LnGrp LOS				C	B	B	C	A	A	A	B	B
Approach Vol, veh/h					824			713			433	
Approach Delay, s/veh					19.2			12.3			17.2	
Approach LOS					B			B			B	

Timer - Assigned Phs		2			5	6		8				
Phs Duration (G+Y+Rc), s		46.0			12.0	34.0		34.0				
Change Period (Y+Rc), s		5.0			5.0	5.0		5.0				
Max Green Setting (Gmax), s		41.0			7.0	29.0		29.0				
Max Q Clear Time (g_c+I1), s		2.0			2.0	12.4		15.4				
Green Ext Time (p_c), s		2.6			0.5	2.3		4.3				

Intersection Summary		
HCM 6th Ctrl Delay	16.3	
HCM 6th LOS	B	

Notes

User approved pedestrian interval to be less than phase max green.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	201	509	170	0	0	0	0	464	144	118	313	0
Future Volume (veh/h)	201	509	170	0	0	0	0	464	144	118	313	0
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.96				1.00		0.98	1.00		1.00
Parking Bus, Adj	0.85	1.00	0.85				1.00	1.00	0.85	1.00	1.00	1.00
Work Zone On Approach		No						No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856				0	1870	1870	1885	1885	0
Adj Flow Rate, veh/h	216	547	183				0	494	153	144	382	0
Peak Hour Factor	0.93	0.93	0.93				0.94	0.94	0.94	0.82	0.82	0.82
Percent Heavy Veh, %	3	3	3				0	2	2	1	1	0
Cap, veh/h	326	862	303				0	935	577	342	943	0
Arrive On Green	0.44	0.50	0.44				0.00	0.50	0.44	1.00	1.00	0.00
Sat Flow, veh/h	651	1723	606				0	1870	1320	786	1885	0
Grp Volume(v), veh/h	513	0	433				0	494	153	144	382	0
Grp Sat Flow(s),veh/h/ln	1545	0	1436				0	1870	1320	786	1885	0
Q Serve(g_s), s	20.4	0.0	17.8				0.0	14.4	5.9	8.3	0.0	0.0
Cycle Q Clear(g_c), s	20.4	0.0	17.8				0.0	14.4	5.9	22.7	0.0	0.0
Prop In Lane	0.42		0.42				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	772	0	718				0	935	577	342	943	0
V/C Ratio(X)	0.66	0.00	0.60				0.00	0.53	0.27	0.42	0.41	0.00
Avail Cap(c_a), veh/h	772	0	718				0	935	577	342	943	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	2.00	2.00	1.00
Upstream Filter(I)	1.00	0.00	1.00				0.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	15.9	0.0	15.2				0.0	13.6	14.3	4.1	0.0	0.0
Incr Delay (d2), s/veh	4.5	0.0	3.7				0.0	2.1	1.1	3.8	1.3	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	7.8	0.0	6.3				0.0	6.2	1.9	1.0	0.3	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	20.4	0.0	19.0				0.0	15.7	15.4	7.8	1.3	0.0
LnGrp LOS	C	A	B				A	B	B	A	A	A
Approach Vol, veh/h		946						647			526	
Approach Delay, s/veh		19.7						15.7			3.1	
Approach LOS		B						B			A	

Timer - Assigned Phs	2	4	6
Phs Duration (G+Y+Rc), s	40.0	40.0	40.0
Change Period (Y+Rc), s	5.0	5.0	5.0
Max Green Setting (Gmax), s	35.0	35.0	35.0
Max Q Clear Time (g_c+I1), s	16.4	22.4	24.7
Green Ext Time (p_c), s	3.8	5.3	2.5

Intersection Summary	
HCM 6th Ctrl Delay	14.3
HCM 6th LOS	B

Intersection	
Int Delay, s/veh	61.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	296	0	0	0	165	584
Future Vol, veh/h	296	0	0	0	165	584
Conflicting Peds, #/hr	3	24	0	9	9	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	77	77	79	79	88	88
Heavy Vehicles, %	0	0	1	1	3	3
Mvmt Flow	384	0	0	0	188	664

Major/Minor	Minor1		Major2	
Conflicting Flow All	720	-	9	0
Stage 1	9	-	-	-
Stage 2	711	-	-	-
Critical Hdwy	6.8	-	4.16	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	5.8	-	-	-
Follow-up Hdwy	3.5	-	2.23	-
Pot Cap-1 Maneuver	~ 367	0	1602	-
Stage 1	-	0	-	-
Stage 2	453	0	-	-
Platoon blocked, %				-
Mov Cap-1 Maneuver	~ 295	-	1588	-
Mov Cap-2 Maneuver	~ 295	-	-	-
Stage 1	-	-	-	-
Stage 2	~ 368	-	-	-

Approach	WB	SB
HCM Control Delay, s	194.1	2.1
HCM LOS	F	

Minor Lane/Major Mvmt	WBLn1	SBL	SBT
Capacity (veh/h)	295	1588	-
HCM Lane V/C Ratio	1.303	0.118	-
HCM Control Delay (s)	194.1	7.6	0.5
HCM Lane LOS	F	A	A
HCM 95th %tile Q(veh)	18.8	0.4	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Intersection	
Int Delay, s/veh	4.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	10	10	82	0	0	0	8	625	32	37	349	46
Future Vol, veh/h	10	10	82	0	0	0	8	625	32	37	349	46
Conflicting Peds, #/hr	5	0	21	21	0	5	98	0	74	74	0	98
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	62	62	62	92	92	92	93	93	93	88	88	88
Heavy Vehicles, %	0	0	0	2	2	2	3	3	3	1	1	1
Mvmt Flow	16	16	132	0	0	0	9	672	34	42	397	52

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1317	1403	542	1383	1412	768	547	0	0	780	0	0
Stage 1	605	605	-	781	781	-	-	-	-	-	-	-
Stage 2	712	798	-	602	631	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.12	6.52	6.22	4.13	-	-	4.11	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.518	4.018	3.318	2.227	-	-	2.209	-	-
Pot Cap-1 Maneuver	136	141	544	121	138	402	1017	-	-	842	-	-
Stage 1	488	491	-	388	405	-	-	-	-	-	-	-
Stage 2	427	401	-	486	474	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	115	109	483	66	106	372	922	-	-	783	-	-
Mov Cap-2 Maneuver	115	109	-	66	106	-	-	-	-	-	-	-
Stage 1	435	413	-	355	371	-	-	-	-	-	-	-
Stage 2	418	367	-	308	399	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	31.9	0	0.1	0.8
HCM LOS	D	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	922	-	-	293	-	783	-	-
HCM Lane V/C Ratio	0.009	-	-	0.561	-	0.054	-	-
HCM Control Delay (s)	8.9	0	-	31.9	0	9.9	0	-
HCM Lane LOS	A	A	-	D	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	3.2	-	0.2	-	-

Intersection	
Int Delay, s/veh	8.3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	41	146	45	9	252	61
Future Vol, veh/h	41	146	45	9	252	61
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	45	159	49	10	274	66

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	204	0	233	125
Stage 1	-	-	-	-	125	-
Stage 2	-	-	-	-	108	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1368	-	755	926
Stage 1	-	-	-	-	901	-
Stage 2	-	-	-	-	916	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1368	-	728	926
Mov Cap-2 Maneuver	-	-	-	-	728	-
Stage 1	-	-	-	-	901	-
Stage 2	-	-	-	-	883	-

Approach	EB	WB	NB
HCM Control Delay, s	0	6.4	13.5
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	760	-	-	1368	-
HCM Lane V/C Ratio	0.448	-	-	0.036	-
HCM Control Delay (s)	13.5	-	-	7.7	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	2.3	-	-	0.1	-

Intersection: 1: S Union Street/N Union Street & W Front Street/E Front Street

Movement	WB	WB	WB	NB	NB	SB	SB
Directions Served	LT	T	R	L	T	T	R
Maximum Queue (ft)	252	314	75	125	215	241	129
Average Queue (ft)	133	153	52	100	126	120	36
95th Queue (ft)	217	256	94	148	226	205	91
Link Distance (ft)	373	373			154	293	293
Upstream Blk Time (%)					6	0	0
Queuing Penalty (veh)					41	0	0
Storage Bay Dist (ft)			50	100			
Storage Blk Time (%)		37	4	16	6		
Queuing Penalty (veh)		43	8	54	20		

Intersection: 2: S Union Street & W State Street/E State Street

Movement	EB	EB	NB	NB	SB	SB
Directions Served	LT	TR	T	R	L	T
Maximum Queue (ft)	244	240	220	186	125	184
Average Queue (ft)	145	147	176	52	79	107
95th Queue (ft)	215	219	249	122	134	182
Link Distance (ft)	525	525	195	195		159
Upstream Blk Time (%)			14	1		4
Queuing Penalty (veh)			0	0		16
Storage Bay Dist (ft)					100	
Storage Blk Time (%)					9	12
Queuing Penalty (veh)					29	15

Intersection: 3: Pine Street & W Front Street

Movement	WB	WB
Directions Served	L	T
Maximum Queue (ft)	79	113
Average Queue (ft)	16	19
95th Queue (ft)	52	72
Link Distance (ft)	526	526
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 4: Pine Street & Alley

Movement	WB	SB	SB
Directions Served	L	LT	T
Maximum Queue (ft)	191	68	66
Average Queue (ft)	81	10	5
95th Queue (ft)	153	40	29
Link Distance (ft)	248	176	176
Upstream Blk Time (%)	0		
Queuing Penalty (veh)	0		
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 5: S Union Street & Alley

Movement	EB	NB	SB
Directions Served	LTR	LTR	LTR
Maximum Queue (ft)	188	171	165
Average Queue (ft)	57	69	63
95th Queue (ft)	133	170	154
Link Distance (ft)	228	159	154
Upstream Blk Time (%)	0	2	1
Queuing Penalty (veh)	0	13	5
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 6: Parking Structure & Alley

Movement	EB	WB	NB
Directions Served	TR	LT	LR
Maximum Queue (ft)	10	44	123
Average Queue (ft)	0	9	65
95th Queue (ft)	5	34	104
Link Distance (ft)	248	228	126
Upstream Blk Time (%)			0
Queuing Penalty (veh)			0
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Zone Summary

Zone wide Queuing Penalty: 244

Appendix 5

Program Estimate of Probable Cost



Pioneer
CONSTRUCTION

CITY OF TRAVERSE CITY

WEST END APARTMENTS

PROGRAM ESTIMATE OF PROBABLE COST
DECEMBER 7, 2023





TABLE OF CONTENTS

SECTION 1
Executive Summary

SECTION 2
Conceptual Estimate

SECTION 3
Estimate Clarifications and Assumptions



SECTION 1

EXECUTIVE SUMMARY



TC WEST END APARTMENTS

CONCEPTUAL ESTIMATE

EXECUTIVE SUMMARY

TODAY'S DATE:	12/7/2023
DRAWINGS DATED:	4/7/2023
GROSS SF:	250,858
UNIT:	82

BREAKDOWN BY AREA

SUB-PROJECT	LUMP SUM ESTIMATE	GSF	COST/GSF	UNITS	COST/UNIT
A-B BUILDING	$ 9,086,554	21,741	$ 417.95	26	$ 349,483
LINER BUILDING	$ 20,694,110	51,051	$ 405.36	56	$ 369,538
MOBILITY FIT OUT	$ 536,037	1,100	$ 487.31	N/A	$ -
SHELL SPACE	$ 424,518	5,533	$ 76.72	N/A	
PARKING GARAGE	$ 29,521,258	178,066	$ 165.79	539	$ 54,770
SITE PREP/UTILITIES	$ 798,705	250,858	$ 3.18	82	$ 9,740
PUBLIC SPACE SITE WORK/HARDSCAPE	$ 976,477				
ESTIMATED COST OF CONSTRUCTION			**$**		**62,037,660**

WORK CATEGORY BREAKDOWN

DESCRIPTION	QTY	UNIT	UNIT PRICE	VALUE	COST/SF	COST/UNIT
DEMOLITION		NOT INCLUDED		$ -	$ -	$ -
VAPOR INTRUSION		NOT INCLUDED				
CONCRETE	1	LS	$ 3,997,047	$ 3,997,047	$ 15.93	$ 48,744
PRECAST CONCRETE	1	LS	$ 10,213,556	$ 10,213,556	$ 40.71	$ 124,556
GYPCRETE		NOT INCLUDED		$ -	$ -	$ -
MASONRY	1	LS	$ 2,737,522	$ 2,737,522	$ 10.91	$ 33,384
STEEL	1	LS	$ 3,822,568	$ 3,822,568	$ 15.24	$ 46,617
GENERAL TRADES	1	LS	$ 4,125,069	$ 4,125,069	$ 16.44	$ 50,306
MEMBRANE ROOFING	1	LS	$ 416,265	$ 416,265	$ 1.66	$ 5,076
JOINT SEALANTS	1	LS	$ 397,306	$ 397,306	$ 1.58	$ 4,845
METAL PANELS	1	LS	$ 1,200,844	$ 1,200,844	$ 4.79	$ 14,644
STORE FRONTS	1	LS	$ 1,630,760	$ 1,630,760	$ 6.50	$ 19,887
SPECIAL DOORS	1	LS	$ 15,000	$ 15,000	$ 0.06	$ 183
DRYWALL AND ACOUSTICS	1	LS	$ 3,205,265	$ 3,205,265	$ 12.78	$ 39,089
FLOORING	1	LS	$ 839,638	$ 839,638	$ 3.35	$ 10,239
PAINTING	1	LS	$ 892,788	$ 892,788	$ 3.56	$ 10,888
APPLIANCES	1	LS	$ 451,000	$ 451,000	$ 1.80	$ 5,500
ELEVATORS	1	LS	$ 450,000	$ 450,000	$ 1.79	$ 5,488
FIRE SUPPRESSION	1	LS	$ 240,149	$ 240,149	$ 0.96	$ 2,929
PLUMBING	1	LS	$ 1,945,165	$ 1,945,165	$ 7.75	$ 23,722
HVAC	1	LS	$ 2,773,222	$ 2,773,222	$ 11.05	$ 33,820
ELECTRICAL	1	LS	$ 4,997,924	$ 4,997,924	$ 19.92	$ 60,950
TEMPORARY EARTH RETENTION	1	LS	$ 120,000	$ 120,000	$ 0.48	$ 1,463
SOIL STABILIZATION		NOT INCLUDED		$ -	$ -	$ -
EARTHWORK	1	LS	$ 1,656,208	$ 1,656,208	$ 6.60	$ 20,198
LANDSCAPING AND IRRIGATION	1	LS	$ 331,440	$ 331,440	$ 1.32	$ 4,042
ASPHALT PAVING AND STRIPING	1	LS	$ 9,000	$ 9,000	$ 0.04	$ 110
FENCING		NOT INCLUDED		$ -	$ -	$ -
SUB TOTAL WORK CATEGORIES				**$ 46,467,732**	**$ 185.24**	**$ 566,680**
GENERAL CONDITIONS/PROJECT STAFFING		6.00%		$ 2,788,064	$ 11.11	$ 34,001
DESIGN/BIDDING CONTINGENCY		12.00%		$ 5,910,696	$ 23.56	$ 72,082
CONSTRUCTION CONTINGENCY		5.00%		$ 2,758,325	$ 11.00	$ 33,638
DESIGN AND ENGINEERING SERVICES					$ -	$ -
PERMITS & FEES		0.80%		$ 463,399	$ 1.85	$ 5,651
INSURANCE		0.42%		$ 245,231	$ 0.98	$ 2,991
HOME OFFICE OVERHEAD		2.00%		$ 1,172,669	$ 4.67	$ 14,301
PROFIT		3.00%		$ 1,794,183	$ 7.15	$ 21,880
PLM BOND		0.71%		$ 437,362	$ 1.74	$ 5,334
GRAND TOTAL				**$ 62,037,660**	**$ 247.30**	**$ 756,557**

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SECTION 2

CONCEPTUAL ESTIMATE



TC WEST END APARTMENTS

CONCEPTUAL ESTIMATE
GRAND RAPIDS, MI

GENERAL METRICS		ENVELOPE CALC.	
GSF	21,741		0.00%
UNITS	26	STOREFRONTS	27.00%
VSF	13,152	METAL PANELS	0.00%
		MASONRY	73.00%

AB-BUILDING

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
EXISTING CONDITIONS				
BUILDING DEMOLITION		NOT INCLUDED		$ -
				$ -
SUPER STRUCTURE				
CONCRETE FOOTINGS AND WALLS	21,741	GSF	$ 8.50	$ 184,799
SLABS ON GRADE	4,348	GSF	$ 6.55	$ 28,481
ELEVATED SLABS ON METAL DECK		NOT INCLUDED		$ -
STEEL	21,741	GSF	$ 22.00	$ 478,302
CONCRETE TOPPING SLABS	17,393	SF	$ 5.00	$ 86,964
HOLLOW CORE PRECAST PLANKS	21,741	SF	$ 18.00	$ 391,338
GYPCRETE		NOT INCLUDED		$ -
CMU SHAFTS	3,684	SF	$ 38.00	$ 139,992
CMU FIRE WALL	2,400	SF	$ 38	$ 91,200
WOOD FRAMING				$ -
SPRAY APPLIED FIRE PROOFING	21,741	GSF	$ 3.85	$ 83,703
ENVELOPE				$ -
MASONRY VENEER	9,601	SF	$ 70.00	$ 672,067
COLD FORM FRAMED EXTERIOR WALL ASSEMBLIES	13,152	SF	$ 26	$ 338,664
PATIO RAILINGS	30	LF	$ 500.00	$ 15,000
DECORATIVE CANOPY/SIGN	1	LS	$ 75,000	$ 75,000
GENERAL TRADES	21,741	GSF	$ 0.75	$ 16,306
SHINGLE ROOFING		NOT INCLUDED		$ -
MEMBRANE ROOFING	4,348	SF	$ 26.55	$ 115,439
GREEN ROOFING		NOT INCLUDED		$ -
METAL PANELS	-	SF	$ 65.25	$ -
FIBER CEMENT SIDING		NOT INCLUDED		$ -
SOFFIT	1,268	SF	$ 85.00	$ 107,780
EXTERIOR DOORS	8	EA	$ 6,500	$ 52,000
WINDOWS/STOREFRONTS	3,551	SF	$ 125	$ 443,880
OVERHEAD DOORS	1	EA	$ 15,000	$ 15,000
INTERIOR FINISHES				$ -
ROUGH CARPENTRY/GENERAL TRADES	26	UNITS	$ 15,000	$ 390,000
CASEWORK	26	UNITS	$ 3,450	$ 89,700
JOINT SEALANTS	21,741	GSF	$ 0.75	$ 16,306

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Pioneer CONSTRUCTION	TC WEST END APARTMENTS	GENERAL METRICS		ENVELOPE CALC.	
	CONCEPTUAL ESTIMATE	GSF	21,741		0.00%
	GRAND RAPIDS, MI	UNITS	26	STOREFRONTS	27.00%
		VSF	13,152	METAL PANELS	0.00%
				MASONRY	73.00%

AB-BUILDING

COMMERCIAL DOORS, FRAMES, AND HARDWARE	26	UNITS	$ 6,150	$ 159,900
INTERIOR GLASS	26	UNITS	$ 500	$ 13,000
INTERIOR PARTITIONS (Typical)	16,464	SF	$ 12.75	$ 209,916
DEMISING WALLS	13,908	SF	$ 18.75	$ 260,775
DRYWALL CEILINGS	6,608	SF	$ 8	$ 54,516
ACT CEILINGS IN CORRIDORS	3,880	SF	$ 10	$ 37,830
FLOORING	21,741	GSF	$ 7.75	$ 168,493
TILE SHOWER SURROUNDS		NOT INCLUDED		$ -
TILE BACK SPLASH	26	UNITS	$ 1,500	$ 39,000
PAINTING AND WALL COVERING	21,741	GSF	$ 5.50	$ 119,576
GLASS SHOWER DOORS		NOT INCLUDED		$ -
BATHROOM ACCESSORIES	26	UNITS	$ 1,100	$ 28,600
SHELVING	26	UNITS	$ 650	$ 16,900
MAIL LOCKERS	26	UNITS	$ 250	$ 6,500
FIRE EXTINGUISHERS	26	UNITS	$ 350	$ 9,100
TOILET COMPARTMENTS		NOT INCLUDED		$ -
SIGNAGE		NOT INCLUDED		$ -
QUARTZ COUNTERS AND SILLS	26	UNITS	$ 2,450	$ 63,700
WINDOW TREATMENTS	26	UNITS	$ 1,100	$ 28,600
EQUIPMENT/FURNITURE/SPECIAL CONSTRUCTION				$ -
RESIDENTIAL APPLIANCES	26	EA	$ 5,500	$ 143,000
POOL		NOT INCLUDED		
TRASH CHUTE	1	LS	$ 15,000	$ 15,000
TRASH COMPACTOR		NOT INCLUDED		$ -
ELEVATOR		WITH PARKING STRUCTURE		$ -
SYSTEMS				$ -
FIRE PROTECTION	21,741	GSF	$ 3.25	$ 70,658
PLUMBING	26	UNITS	$ 17,500	$ 455,000
HVAC	21,741	GSF	$ 23.55	$ 512,001
ELECTRICAL/SECURITY/SAFETY	21,741	GSF	$ 23.00	$ 500,043
BATTERY BACK UP	1	LS	$ 255,000.00	$ 255,000
SITE WORK				$ -
TEMPORARY EARTH RETENTION		NOT INCLUDED		$ -
SOIL STABILIZATION		NOT INCLUDED		$ -
SITE DEMOLITION/SESC/GEN CONDITIONS		NOT INCLUDED		$ -

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Pioneer CONSTRUCTION

Pioneer CONSTRUCTION	TC WEST END APARTMENTS	GENERAL METRICS		ENVELOPE CALC.	
	CONCEPTUAL ESTIMATE	GSF	21,741		0.00%
	GRAND RAPIDS, MI	UNITS	26	STOREFRONTS	27.00%
		VSF	13,152	METAL PANELS	0.00%
				MASONRY	73.00%

AB-BUILDING

MASS GRADING		NOT INCLUDED		$ -
TEMPORARY CRANE PADS AND ACCESS ROADS		NOT INCLUDED		$ -
FOOTING EXCAVATION AND BACKFILL	1	LS	$ 125,000	$ 125,000
DOMESTIC WATER LINES		NOT INCLUDED		$ -
SANITARY SEWER LINES		NOT INCLUDED		$ -
STORM SEWER LINES		NOT INCLUDED		$ -
RESPREAD TOP SOIL		NOT INCLUDED		$ -
UNDERGROUND STORM WATER DETENTION		NOT INCLUDED		$ -
ASPHALT PAVING		NOT INCLUDED		$ -
SIDEWALKS		NOT INCLUDED		$ -
RETAINING WALL STRUCTURE		NOT INCLUDED		$ -
RETAINING WALL CLADDING		NOT INCLUDED		$ -
RETAINING WALL RAILING		NOT INCLUDED		$ -
DUMPSTER ENCLOSURE FOOTINGS		NOT INCLUDED		$ -
DUMPSTER ENCLOSURE WALL		NOT INCLUDED		$ -
DUMPSTER ENCLOSURE GATE		NOT INCLUDED		$ -
FENCING		NOT INCLUDED		$ -
LANDSCAPING/IRRIGATION		NOT INCLUDED		$ -
SUB-TOTAL WORK CATEGORIES				**$ 7,124,027**
OTHER COSTS				
GENERAL CONDITIONS/PROJECT STAFFING	1	LS		$ 427,442
DESIGN/BIDDING CONTINGENCY		12.00%		$ 906,176
CONSTRUCTION CONTINGENCY		5.00%		$ 422,882
DESIGN AND ENGINEERING SERVICES		NOT INCLUDED		
PERMITS & FEES		0.80%		$ 71,044
INSURANCE		0.42%		$ 37,597
HOME OFFICE OVERHEAD		2.00%		$ 179,783
PROFIT		3.00%		$ 275,069
PLM BOND		0.71%		$ 67,053
TOTAL ESTIMATE				**$ 9,511,073**

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TC WEST END APARTMENTS

CONCEPTUAL ESTIMATE
GRAND RAPIDS, MI

GENERAL METRICS		ENVELOPE CALC.	
GSF	51,051		0.00%
UNITS	56	STOREFRONTS	33.00%
VSF	23,088	METAL PANELS	13.00%
		MASONRY	54.00%

LINER BUILDING

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
EXISTING CONDITIONS				
BUILDING DEMOLITION		NOT INCLUDED		$ -
				$ -
SUPER STRUCTURE				
CONCRETE FOOTINGS AND WALLS	51,051	GSF	$ 8.50	$ 433,934
SLABS ON GRADE	10,210	GSF	$ 6.55	$ 66,877
ELEVATED SLABS ON METAL DECK		NOT INCLUDED		$ -
STEEL	51,051	GSF	$ 22.00	$ 1,123,122
CONCRETE TOPPING SLABS	40,841	SF	$ 5.00	$ 204,204
HOLLOW CORE PRECAST PLANKS	51,051	SF	$ 18.00	$ 918,918
GYPCRETE		NOT INCLUDED		$ -
CMU SHAFTS	11,088	SF	$ 38.00	$ 421,344
CMU FIRE WALL	8,880	SF	$ 38	$ 337,440
WOOD FRAMING				$ -
SPRAY APPLIED FIRE PROOFING	51,051	GSF	$ 3.85	$ 196,546
ENVELOPE				$ -
MASONRY VENEER	12,468	SF	$ 70.00	$ 872,726
COLD FORM FRAMED EXTERIOR WALL ASSEMBLIES	23,088	SF	$ 26	$ 594,516
PATIO RAILINGS	40	LF	$ 500.00	$ 20,000
GENERAL TRADES	51,051	GSF	$ 0.75	$ 38,288
SHINGLE ROOFING		NOT INCLUDED		$ -
MEMBRANE ROOFING	10,210	SF	$ 26.55	$ 271,076
GREEN ROOFING		NOT INCLUDED		$ -
METAL PANELS	3,001	SF	$ 65.25	$ 195,844
FIBER CEMENT SIDING		NOT INCLUDED		$ -
SOFFIT	1,268	SF	$ 85.00	$ 107,780
EXTERIOR DOORS	21	EA	$ 6,500	$ 136,500
WINDOWS/STOREFRONTS	7,619	SF	$ 125	$ 952,380
OVERHEAD DOORS		NOT INCLUDED		$ -
INTERIOR FINISHES				$ -
ROUGH CARPENTRY/GENERAL TRADES	56	UNITS	$ 15,000	$ 840,000
CASEWORK	56	UNITS	$ 3,450	$ 193,200
JOINT SEALANTS	51,051	GSF	$ 0.75	$ 38,288
COMMERCIAL DOORS, FRAMES, AND HARDWARE	56	UNITS	$ 6,150	$ 344,400

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Pioneer CONSTRUCTION	TC WEST END APARTMENTS	GENERAL METRICS		ENVELOPE CALC.	
	CONCEPTUAL ESTIMATE	GSF	51,051		0.00%
	GRAND RAPIDS, MI	UNITS	56	STOREFRONTS	33.00%
		VSF	23,088	METAL PANELS	13.00%
				MASONRY	54.00%

LINER BUILDING

INTERIOR GLASS	56	UNITS	$ 500	$ 28,000
INTERIOR PARTITIONS (Typical)	29,700	SF	$ 12.75	$ 378,675
DEMISING WALLS	46,044	SF	$ 18.75	$ 863,325
DRYWALL CEILINGS	6,608	SF	$ 8	$ 54,516
ACT CEILINGS IN CORRIDORS	9,470	SF	$ 10	$ 92,333
FLOORING	51,051	GSF	$ 7.75	$ 395,645
TILE SHOWER SURROUNDS		NOT INCLUDED		$ -
TILE BACK SPLASH	56	UNITS	$ 1,500	$ 84,000
PAINTING AND WALL COVERING	51,051	GSF	$ 5.50	$ 280,781
GLASS SHOWER DOORS		NOT INCLUDED		$ -
BATHROOM ACCESSORIES	56	UNITS	$ 1,100	$ 61,600
SHELVING	56	UNITS	$ 650	$ 36,400
MAIL LOCKERS	56	UNITS	$ 250	$ 14,000
FIRE EXTINGUISHERS	56	UNITS	$ 350	$ 19,600
TOILET COMPARTMENTS		NOT INCLUDED		$ -
SIGNAGE		NOT INCLUDED		$ -
QUARTZ COUNTERS AND SILLS	56	UNITS	$ 2,450	$ 137,200
WINDOW TREATMENTS	56	UNITS	$ 1,100	$ 61,600
EQUIPMENT/FURNITURE/SPECIAL CONSTRUCTION				$ -
RESIDENTIAL APPLIANCES	56	EA	$ 5,500	$ 308,000
POOL		NOT INCLUDED		
TRASH CHUTE	1	LS	$ 15,000	$ 15,000
TRASH COMPACTOR	1	LS	$ 25,000	$ 25,000
ELEVATOR	1	EA	$ 225,000	$ 225,000
SYSTEMS				$ -
FIRE PROTECTION	51,051	GSF	$ 3.25	$ 165,916
PLUMBING	56	UNITS	$ 17,500	$ 980,000
HVAC	51,051	GSF	$ 23.55	$ 1,202,251
ELECTRICAL/SECURITY/SAFETY	51,051	GSF	$ 23.00	$ 1,174,173
BATTERY BACK UP	1	LS	$ 340,000	$ 340,000
SITE WORK				$ -
TEMPORARY EARTH RETENTION		NOT INCLUDED		$ -
SOIL STABILIZATION		NOT INCLUDED		$ -
SITE DEMOLITION/SESC/GEN CONDITIONS		NOT INCLUDED		$ -
MASS GRADING		NOT INCLUDED		$ -

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Pioneer CONSTRUCTION	TC WEST END APARTMENTS	GENERAL METRICS		ENVELOPE CALC.	
	CONCEPTUAL ESTIMATE	GSF	51,051		0.00%
	GRAND RAPIDS, MI	UNITS	56	STOREFRONTS	33.00%
		VSF	23,088	METAL PANELS	13.00%
				MASONRY	54.00%

LINER BUILDING

TEMPORARY CRANE PADS AND ACCESS ROADS		NOT INCLUDED		$ -
FOOTING EXCAVATION AND BACKFILL	1	LS	$ 250,000	$ 250,000
DOMESTIC WATER LINES		NOT INCLUDED		$ -
SANITARY SEWER LINES		NOT INCLUDED		$ -
STORM SEWER LINES		NOT INCLUDED		$ -
RESPREAD TOP SOIL		NOT INCLUDED		$ -
UNDERGROUND STORM WATER DETENTION		NOT INCLUDED		$ -
ASPHALT PAVING		NOT INCLUDED		$ -
SIDEWALKS		NOT INCLUDED		$ -
RETAINING WALL STRUCTURE		NOT INCLUDED		$ -
RETAINING WALL CLADDING		NOT INCLUDED		$ -
RETAINING WALL RAILING		NOT INCLUDED		$ -
DUMPSTER ENCLOSURE FOOTINGS		NOT INCLUDED		$ -
DUMPSTER ENCLOSURE WALL		NOT INCLUDED		$ -
DUMPSTER ENCLOSURE GATE		NOT INCLUDED		$ -
FENCING		NOT INCLUDED		$ -
LANDSCAPING/IRRIGATION		NOT INCLUDED		$ -
SUB-TOTAL WORK CATEGORIES				**$ 15,500,397**
OTHER COSTS				
GENERAL CONDITIONS/PROJECT STAFFING	1	LS		$ 930,024
DESIGN/BIDDING CONTINGENCY		12.00%		$ 1,971,651
CONSTRUCTION CONTINGENCY		5.00%		$ 920,104
DESIGN AND ENGINEERING SERVICES		NOT INCLUDED		
PERMITS & FEES		0.80%		$ 154,577
INSURANCE		0.42%		$ 81,802
HOME OFFICE OVERHEAD		2.00%		$ 391,171
PROFIT		3.00%		$ 598,492
PLM BOND		0.71%		$ 145,892
TOTAL ESTIMATE				**$ 20,694,110**

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	TC WEST END APARTMENTS	GENERAL METRICS		ENVELOPE CALC.	
Pioneer CONSTRUCTION	CONCEPTUAL ESTIMATE	GSF	1,100		0.00%
	GRAND RAPIDS, MI	UNITS	-	STOREFRONTS	0.00%
		VSF	-	METAL PANELS	0.00%
				MASONRY	0.00%

LINER BUILDING

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
EXISTING CONDITIONS				
BUILDING DEMOLITION		NOT INCLUDED		$ -
				$ -
SUPER STRUCTURE				
CONCRETE FOOTINGS AND WALLS		NOT INCLUDED		$ -
SLABS ON GRADE		NOT INCLUDED		$ -
ELEVATED SLABS ON METAL DECK		NOT INCLUDED		$ -
STEEL		NOT INCLUDED		$ -
CONCRETE TOPPING SLABS		NOT INCLUDED		$ -
HOLLOW CORE PRECAST PLANKS		NOT INCLUDED		$ -
GYPCRETE		NOT INCLUDED		$ -
CMU SHAFTS		NOT INCLUDED		$ -
CMU FIRE WALL		NOT INCLUDED		$ -
WOOD FRAMING		NOT INCLUDED		$ -
SPRAY APPLIED FIRE PROOFING		NOT INCLUDED		$ -
ENVELOPE				$ -
MASONRY VENEER		NOT INCLUDED		$ -
COLD FORM FRAMED EXTERIOR WALL ASSEMBLIES		NOT INCLUDED		$ -
PATIO RAILINGS		NOT INCLUDED		$ -
GENERAL TRADES		NOT INCLUDED		$ -
SHINGLE ROOFING		NOT INCLUDED		$ -
MEMBRANE ROOFING		NOT INCLUDED		$ -
GREEN ROOFING		NOT INCLUDED		$ -
METAL PANELS		NOT INCLUDED		$ -
FIBER CEMENT SIDING		NOT INCLUDED		$ -
SOFFIT		NOT INCLUDED		$ -
EXTERIOR DOORS		NOT INCLUDED		$ -
WINDOWS/STOREFRONTS		NOT INCLUDED		$ -
OVERHEAD DOORS		NOT INCLUDED		$ -
INTERIOR FINISHES				$ -
ROUGH CARPENTRY/GENERAL TRADES	1,100	GSF	$ 12	$ 13,200
CASEWORK	1	LS	$ 7,500	$ 7,500
JOINT SEALANTS	1,100	GSF	$ 0.75	$ 825
COMMERCIAL DOORS, FRAMES, AND HARDWARE	10	EA	$ 4,500	$ 45,000

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Pioneer CONSTRUCTION	TC WEST END APARTMENTS	GENERAL METRICS		ENVELOPE CALC.	
	CONCEPTUAL ESTIMATE	GSF	1,100		0.00%
	GRAND RAPIDS, MI	UNITS	-	STOREFRONTS	0.00%
		VSF	-	METAL PANELS	0.00%
				MASONRY	0.00%

LINER BUILDING

INTERIOR GLASS	10	EA	$ 500	$ 5,000
INTERIOR PARTITIONS (Typical)	1,700	GSF	$ 23.50	$ 39,950
FLOORING	1,100	GSF	$ 25.00	$ 27,500
TILE WALLS	1	LS	$ 125,000	$ 125,000
TILE BACK SPLASH	-	UNITS	$ 1,500	$ -
PAINTING AND WALL COVERING	1,100	GSF	$ 2.50	$ 2,750
GLASS SHOWER DOORS		NOT INCLUDED		$ -
BATHROOM ACCESSORIES	10	EA	$ 1,100	$ 11,000
SHELVING		NOT INCLUDED		$ -
MAIL LOCKERS		NOT INCLUDED		$ -
FIRE EXTINGUISHERS	2	EA	$ 750	$ 1,500
TOILET COMPARTMENTS		NOT INCLUDED		$ -
SIGNAGE		NOT INCLUDED		$ -
QUARTZ COUNTERS AND SILLS	10	EA	$ 250	$ 2,500
WINDOW TREATMENTS		NOT INCLUDED		$ -
EQUIPMENT/FURNITURE/SPECIAL CONSTRUCTION				$ -
RESIDENTIAL APPLIANCES		NOT INCLUDED		$ -
POOL		NOT INCLUDED		
TRASH CHUTE		NOT INCLUDED		$ -
TRASH COMPACTOR		NOT INCLUDED		$ -
ELEVATOR		NOT INCLUDED		$ -
SYSTEMS				$ -
FIRE PROTECTION	1,100	GSF	$ 3.25	$ 3,575
PLUMBING	1	LS	$ 65,000	$ 65,000
HVAC	1,100	GSF	$ 23.55	$ 25,905
ELECTRICAL/SECURITY/SAFETY	1,100	GSF	$ 23.00	$ 25,300
SITE WORK				$ -
TEMPORARY EARTH RETENTION		NOT INCLUDED		$ -
SOIL STABILIZATION		NOT INCLUDED		$ -
SITE DEMOLITION/SESC/GEN CONDITIONS		NOT INCLUDED		$ -
MASS GRADING		NOT INCLUDED		$ -
TEMPORARY CRANE PADS AND ACCESS ROADS		NOT INCLUDED		$ -
FOOTING EXCAVATION AND BACKFILL		NOT INCLUDED		$ -
DOMESTIC WATER LINES		NOT INCLUDED		$ -
SANITARY SEWER LINES		NOT INCLUDED		$ -

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Pioneer CONSTRUCTION	TC WEST END APARTMENTS	GENERAL METRICS		ENVELOPE CALC.	
	CONCEPTUAL ESTIMATE	GSF	1,100		0.00%
	GRAND RAPIDS, MI	UNITS	-	STOREFRONTS	0.00%
		VSF	-	METAL PANELS	0.00%
				MASONRY	0.00%

LINER BUILDING

STORM SEWER LINES		NOT INCLUDED		$ -
RESPREAD TOP SOIL		NOT INCLUDED		$ -
UNDERGROUND STORM WATER DETENTION		NOT INCLUDED		$ -
ASPHALT PAVING		NOT INCLUDED		$ -
SIDEWALKS		NOT INCLUDED		$ -
RETAINING WALL STRUCTURE		NOT INCLUDED		$ -
RETAINING WALL CLADDING		NOT INCLUDED		$ -
RETAINING WALL RAILING		NOT INCLUDED		$ -
DUMPSTER ENCLOSURE FOOTINGS		NOT INCLUDED		$ -
DUMPSTER ENCLOSURE WALL		NOT INCLUDED		$ -
DUMPSTER ENCLOSURE GATE		NOT INCLUDED		$ -
FENCING		NOT INCLUDED		$ -
LANDSCAPING/IRRIGATION		NOT INCLUDED		$ -
SUB-TOTAL WORK CATEGORIES				**$ 401,505**
OTHER COSTS				
GENERAL CONDITIONS/PROJECT STAFFING	1	LS		$ 24,090
DESIGN/BIDDING CONTINGENCY		12.00%		$ 51,071
CONSTRUCTION CONTINGENCY		5.00%		$ 23,833
DESIGN AND ENGINEERING SERVICES		NOT INCLUDED		
PERMITS & FEES		0.80%		$ 4,004
INSURANCE		0.42%		$ 2,119
HOME OFFICE OVERHEAD		2.00%		$ 10,132
PROFIT		3.00%		$ 15,503
PLM BOND		0.71%		$ 3,779
TOTAL ESTIMATE				**$ 536,037**

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TC WEST END APARTMENTS	GENERAL METRICS		ENVELOPE CALC.	
CONCEPTUAL ESTIMATE	GSF	178,066	WINDOWS	
GRAND RAPIDS, MI	UNITS	539	STOREFRONTS	
	VSF	-	MASONRY	
			FIBER CEMENT	100.00%

PARKING STRUCTURE

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
EXISTING CONDITIONS				
BUILDING DEMOLITION		NOT INCLUDED		$ -
SUPER STRUCTURE				
CAST IN PLACE CONCRETE (FOUNDATIONS AND TOPPING SLABS)	152,469	GSF	$ 16.50	$ 2,515,739
SPLIT SLAB WITH INSULATION	25,598	GSF	$ 12.75	$ 326,375
STEEL	178,066	GSF	$ 9.75	$ 1,736,144
SCREEN SUPPORT SYSTEMS	1	LS	$ 375,000	$ 375,000
PRECAST CONCRETE	178,066	GSF	$ 50.00	$ 8,903,300
CMU SHAFTS/WALLS	6,336	SF	$ 32.00	$ 202,752
WOOD FRAMING/CLT		NOT INCLUDED		$ -
SPRAY APPLIED FIRE PROOFING		NOT INCLUDED		$ -
ENVELOPE				$ -
MASONRY VENEER		NOT INCLUDED		$ -
PATIO RAILINGS		NOT INCLUDED		$ -
GENERAL TRADES		NOT INCLUDED		$ -
SHINGLE ROOFING		NOT INCLUDED		$ -
TRAFFIC COATING	7,123	SF	$ 6.75	$ 48,078
JOINT SEALANTS/EXPANSION JOINTS	178,066	SF	$ 1.65	$ 293,809
MEMBRANE ROOFING	850	SF	$ 35.00	$ 29,750
MESH SCREENING	20,000	SF	$ 50.25	$ 1,005,000
EIFS		NOT INCLUDED		$ -
FIBER CEMENT SIDING		NOT INCLUDED		$ -
SOFFIT		NOT INCLUDED		$ -
FIBERGLASS RESIDENTIAL WINDOWS		NOT INCLUDED		$ -
EXTERIOR DOORS		NOT INCLUDED		$ -
ALUMINUM FRAMED STOREFRONTS		NOT INCLUDED		$ -
PAINTING		NOT INCLUDED		$ -
OVERHEAD DOORS		NOT INCLUDED		$ -
INTERIOR FINISHES				$ -
ROUGH CARPENTRY/GENERAL TRADES	178,066	GSF	$ 3.25	$ 578,715
CASEWORK	1	LS	$ 20,000	$ 20,000
JOINT SEALANTS		NOT INCLUDED		$ -

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Pioneer CONSTRUCTION	TC WEST END APARTMENTS	GENERAL METRICS		ENVELOPE CALC.	
	CONCEPTUAL ESTIMATE	GSF	178,066	WINDOWS	
	GRAND RAPIDS, MI	UNITS	539	STOREFRONTS	
		VSF	-	MASONRY	
				FIBER CEMENT	100.00%

PARKING STRUCTURE

COMMERCIAL DOORS, FRAMES, AND HARDWARE	27	EA	$ 3,500	$ 94,500
INTERIOR GLASS		NOT INCLUDED		$ -
INSULATED CEILING ASSEMBLY		NOT INCLUDED		$ -
FLOORING		NOT INCLUDED		$ -
PAINTING AND WALL COVERING	178,066	GSF	$ 2.75	$ 489,682
SPECIALTIES	1	LS	$ 25,000.00	$ 25,000
EQUIPMENT/FURNITURE/SPECIAL CONSTRUCTION				$ -
RESIDENTIAL APPLIANCES		NOT INCLUDED		$ -
FSE		NOT INCLUDED		$ -
POOL		NOT INCLUDED		$ -
TRASH CHUTE		NOT INCLUDED		$ -
PARKING CONTROL EQUIPMENT	1	LS	$ 500,000	$ 500,000
ELEVATOR	1	LS	$ 225,000	$ 225,000
SYSTEMS				$ -
FIRE PROTECTION		NOT INCLUDED		$ -
PLUMBING	178,066	SF	$ 2.50	$ 445,165
HVAC (SNOW MELT AREA C)	1	LS	$ 844,734	$ 844,734
ELECTRICAL/SECURITY/SAFETY	178,066	SF	$ 13.75	$ 2,448,408
BATTERY BACK UP	1	LS	$ 255,000	$ 255,000
SITE WORK				$ -
TEMPORARY EARTH RETENTION		NOT INCLUDED		$ -
SOIL STABILIZATION		NOT INCLUDED		$ -
SITE DEMOLITION/SESC/GEN CONDITIONS		NOT INCLUDED		$ -
MASS GRADING		NOT INCLUDED		$ -
TEMPORARY CRANE PADS AND ACCESS ROADS		NOT INCLUDED		$ -
FOOTING EXCAVATION AND BACKFILL	1	LS	$ 750,000	$ 750,000
DOMESTIC WATER LINES		NOT INCLUDED		$ -
SANITARY SEWER LINES		NOT INCLUDED		$ -
STORM SEWER LINES		NOT INCLUDED		$ -
RESPREAD TOP SOIL		NOT INCLUDED		$ -
UNDERGROUND STORM WATER DETENTION		NOT INCLUDED		$ -
ASPHALT PAVING		NOT INCLUDED		$ -
SIDEWALKS		NOT INCLUDED		$ -

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Pioneer CONSTRUCTION	TC WEST END APARTMENTS	GENERAL METRICS		ENVELOPE CALC.	
	CONCEPTUAL ESTIMATE	GSF	178,066	WINDOWS	
	GRAND RAPIDS, MI	UNITS	539	STOREFRONTS	
		VSF	-	MASONRY	
				FIBER CEMENT	100.00%

PARKING STRUCTURE

RETAINING WALL STRUCTURE		NOT INCLUDED		$ -
RETAINING WALL CLADDING		NOT INCLUDED		$ -
RETAINING WALL RAILING		NOT INCLUDED		$ -
DUMPSTER ENCLOSURE FOOTINGS		NOT INCLUDED		$ -
DUMPSTER ENCLOSURE WALL		NOT INCLUDED		$ -
DUMPSTER ENCLOSURE GATE		NOT INCLUDED		$ -
FENCING		NOT INCLUDED		$ -
LANDSCAPING/IRRIGATION		NOT INCLUDED		$ -
SUB-TOTAL WORK CATEGORIES				**$ 22,112,148**
OTHER COSTS				
GENERAL CONDITIONS/PROJECT STAFFING	1	LS		$ 1,326,729
DESIGN/BIDDING CONTINGENCY		12.00%		$ 2,812,665
CONSTRUCTION CONTINGENCY		5.00%		$ 1,312,577
DESIGN AND ENGINEERING SERVICES		NOT INCLUDED		
PERMITS & FEES		0.80%		$ 220,513
INSURANCE		0.42%		$ 116,695
HOME OFFICE OVERHEAD		2.00%		$ 558,027
PROFIT		3.00%		$ 853,781
PLM BOND		0.71%		$ 208,123
TOTAL ESTIMATE				**$ 29,521,258**

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Pioneer CONSTRUCTION	**TC WEST END APARTMENTS**	**GENERAL METRICS**		**ENVELOPE CALC.**	
	CONCEPTUAL ESTIMATE	GSF	-	WINDOWS	15.00%
	GRAND RAPIDS, MI	UNITS	-	STOREFRONTS	30.00%
		VSF	-	MASONRY	15.00%
				FIBER CEMENT	40.00%

SITE DEVELOPMENT

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
GENERAL REQUIREMENTS				$ -
GENERAL REQUIREMENTS	1	LS	$ -	$ -
EXISTING CONDITIONS				
BUILDING DEMOLITION		NOT INCLUDED		$ -
				$ -
SUPER STRUCTURE				
CONCRETE FOOTINGS AND WALLS		NOT INCLUDED		$ -
SLABS ON GRADE		NOT INCLUDED		$ -
ELEVATED SLABS ON METAL DECK		NOT INCLUDED		$ -
STEEL		NOT INCLUDED		$ -
CONCRETE TOPPING SLABS		NOT INCLUDED		$ -
PRECAST CONCRETE		NOT INCLUDED		$ -
GYPCRETE		NOT INCLUDED		$ -
CMU SHAFTS		NOT INCLUDED		$ -
WOOD FRAMING		NOT INCLUDED		$ -
SPRAY APPLIED FIRE PROOFING		NOT INCLUDED		$ -
BALCONIES		NOT INCLUDED		$ -
ENVELOPE				$ -
MASONRY VENEER		NOT INCLUDED		$ -
PATIO RAILINGS		NOT INCLUDED		$ -
GENERAL TRADES		NOT INCLUDED		$ -
SHINGLE ROOFING		NOT INCLUDED		$ -
MEMBRANE ROOFING		NOT INCLUDED		$ -
GREEN ROOFING		NOT INCLUDED		$ -
EIFS		NOT INCLUDED		$ -
FIBER CEMENT SIDING		NOT INCLUDED		$ -
SOFFIT		NOT INCLUDED		$ -
FIBERGLASS RESIDENTIAL WINDOWS		NOT INCLUDED		$ -
EXTERIOR DOORS		NOT INCLUDED		$ -
ALUMINUM FRAMED STOREFRONTS		NOT INCLUDED		$ -
PAINTING		NOT INCLUDED		$ -
OVERHEAD DOORS		NOT INCLUDED		$ -

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Pioneer CONSTRUCTION	TC WEST END APARTMENTS	GENERAL METRICS		ENVELOPE CALC.	
	CONCEPTUAL ESTIMATE	GSF	-	WINDOWS	15.00%
	GRAND RAPIDS, MI	UNITS	-	STOREFRONTS	30.00%
		VSF	-	MASONRY	15.00%
				FIBER CEMENT	40.00%

SITE DEVELOPMENT

INTERIOR FINISHES		NOT INCLUDED		$	-
ROUGH CARPENTRY/GENERAL TRADES		NOT INCLUDED		$	-
LEAN RAILING-CORRIDORS		NOT INCLUDED		$	-
CASEWORK		NOT INCLUDED		$	-
JOINT SEALANTS		NOT INCLUDED		$	-
COMMERCIAL DOORS, FRAMES, AND HARDWARE		NOT INCLUDED		$	-
INTERIOR GLASS		NOT INCLUDED		$	-
DRYWALL AND ACOUSTICS		NOT INCLUDED		$	-
FLOORING		NOT INCLUDED		$	-
TILE SHOWER SURROUNDS		NOT INCLUDED		$	-
TILE BACK SPLASH		NOT INCLUDED		$	-
PAINTING AND WALL COVERING		NOT INCLUDED		$	-
GLASS SHOWER DOORS		NOT INCLUDED		$	-
BATHROOM ACCESSORIES		NOT INCLUDED		$	-
SHELVING		NOT INCLUDED		$	-
MAIL LOCKERS		NOT INCLUDED		$	-
FIRE EXTINGUISHERS		NOT INCLUDED		$	-
TOILET COMPARTMENTS		NOT INCLUDED		$	-
SIGNAGE		NOT INCLUDED		$	-
QUARTZ COUNTERS AND SILLS		NOT INCLUDED		$	-
WINDOW TREATMENTS		NOT INCLUDED		$	-
EQUIPMENT/FURNITURE/SPECIAL CONSTRUCTION				$	-
RESIDENTIAL APPLIANCES		NOT INCLUDED		$	-
POOL		NOT INCLUDED			
TRASH CHUTE		NOT INCLUDED		$	-
TRASH COMPACTOR		NOT INCLUDED		$	-
ELEVATOR		NOT INCLUDED		$	-
SYSTEMS				$	-
FIRE PROTECTION		NOT INCLUDED		$	-
PLUMBING		NOT INCLUDED		$	-
HVAC		NOT INCLUDED		$	-
ELECTRICAL/SECURITY/SAFETY		NOT INCLUDED		$	-
SITE WORK				$	-

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Pioneer CONSTRUCTION	TC WEST END APARTMENTS	GENERAL METRICS		ENVELOPE CALC.	
	CONCEPTUAL ESTIMATE	GSF	-	WINDOWS	15.00%
	GRAND RAPIDS, MI	UNITS	-	STOREFRONTS	30.00%
		VSF	-	MASONRY	15.00%
				FIBER CEMENT	40.00%

SITE DEVELOPMENT

TEMPORARY EARTH RETENTION	1	ALLOWANCE	$ 120,000	$ 120,000
SOIL STABILIZATION		NOT INCLUDED		$ -
SITE DEMOLITION/SESC/GEN CONDITIONS		BY OTHERS		$ -
MASS GRADING		BY OTHERS		$ -
TEMPORARY CRANE PADS AND ACCESS ROADS	1	LS	$ 125,000	$ 125,000
FOOTING EXCAVATION AND BACKFILL		NOT INCLUDED		$ -
FOOTING EXCAVATION AND BACKFILL		NOT INCLUDED		$ -
DOMESTIC WATER LINES	300	LF	$ 287.50	$ 86,250
SANITARY SEWER LINES	100	LF	$ 350.00	$ 35,000
STORM SEWER LINES	160	LF	$ 300.00	$ 48,000
RESPREAD TOP SOIL		NOT INCLUDED		$ -
UNDERGROUND STORM WATER DETENTION/PRE-TREATMENT	1	LS	$ 150,000	$ 150,000
SAND SEPARATOR	1	LS	$ 25,000	$ 25,000
ASPHALT PAVING (PATCHING FOR UTILITY TIE IN)	300	SY	$ 30.00	$ 9,000
SIDEWALKS		NOT INCLUDED		$ -
CONCRETE DRIVEW		NOT INCLUDED		$ -
RETAINING WALL STRUCTURE		NOT INCLUDED		$ -
RETAINING WALL CLADDING		NOT INCLUDED		$ -
RETAINING WALL RAILING		NOT INCLUDED		$ -
DUMPSTER ENCLOSURE FOOTINGS		NOT INCLUDED		$ -
DUMPSTER ENCLOSURE WALL		NOT INCLUDED		$ -
DUMPSTER ENCLOSURE GATE		NOT INCLUDED		$ -
FENCING		NOT INCLUDED		$ -
SITE FURNISHINGS		NOT INCLUDED		$ -
LANDSCAPING/IRRIGATION		NOT INCLUDED		$ -
SUB-TOTAL WORK CATEGORIES				**$ 598,250**
OTHER COSTS				
GENERAL CONDITIONS/PROJECT STAFFING	1	LS		$ 35,895
DESIGN/BIDDING CONTINGENCY		12.00%		$ 76,097
CONSTRUCTION CONTINGENCY		5.00%		$ 35,512
DESIGN AND ENGINEERING SERVICES		NOT INCLUDED		
PERMITS & FEES		0.80%		$ 5,966
INSURANCE		0.42%		$ 3,157

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TC WEST END APARTMENTS		GENERAL METRICS		ENVELOPE CALC.	
CONCEPTUAL ESTIMATE	GSF	-		WINDOWS	15.00%
GRAND RAPIDS, MI	UNITS	-		STOREFRONTS	30.00%
	VSF	-		MASONRY	15.00%
				FIBER CEMENT	40.00%

SITE DEVELOPMENT

HOME OFFICE OVERHEAD		2.00%		$ 15,098
PROFIT		3.00%		$ 23,099
PLM BOND		0.71%		$ 5,631
TOTAL ESTIMATE				**$ 798,705**

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Pioneer CONSTRUCTION	**TC WEST END APARTMENTS**	**GENERAL METRICS**		**ENVELOPE CALC.**	
	CONCEPTUAL ESTIMATE	GSF	-	WINDOWS	15.00%
	GRAND RAPIDS, MI	UNITS	-	STOREFRONTS	30.00%
		VSF	-	MASONRY	15.00%
				FIBER CEMENT	40.00%

SITE DEVELOPMENT

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
GENERAL REQUIREMENTS				$ -
GENERAL REQUIREMENTS	1	LS	$ -	$ -
EXISTING CONDITIONS				
BUILDING DEMOLITION		NOT INCLUDED		$ -
				$ -
SUPER STRUCTURE				
CONCRETE FOOTINGS AND WALLS		NOT INCLUDED		$ -
SLABS ON GRADE		NOT INCLUDED		$ -
ELEVATED SLABS ON METAL DECK		NOT INCLUDED		$ -
STEEL		NOT INCLUDED		$ -
CONCRETE TOPPING SLABS		NOT INCLUDED		$ -
PRECAST CONCRETE		NOT INCLUDED		$ -
GYPCRETE		NOT INCLUDED		$ -
CMU SHAFTS		NOT INCLUDED		$ -
WOOD FRAMING		NOT INCLUDED		$ -
SPRAY APPLIED FIRE PROOFING		NOT INCLUDED		$ -
BALCONIES		NOT INCLUDED		$ -
ENVELOPE				$ -
MASONRY VENEER		NOT INCLUDED		$ -
PATIO RAILINGS		NOT INCLUDED		$ -
GENERAL TRADES		NOT INCLUDED		$ -
SHINGLE ROOFING		NOT INCLUDED		$ -
MEMBRANE ROOFING		NOT INCLUDED		$ -
GREEN ROOFING		NOT INCLUDED		$ -
EIFS		NOT INCLUDED		$ -
FIBER CEMENT SIDING		NOT INCLUDED		$ -
SOFFIT		NOT INCLUDED		$ -
FIBERGLASS RESIDENTIAL WINDOWS		NOT INCLUDED		$ -
EXTERIOR DOORS		NOT INCLUDED		$ -
ALUMINUM FRAMED STOREFRONTS		NOT INCLUDED		$ -
PAINTING		NOT INCLUDED		$ -
OVERHEAD DOORS		NOT INCLUDED		$ -

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Pioneer CONSTRUCTION	TC WEST END APARTMENTS	GENERAL METRICS		ENVELOPE CALC.	
	CONCEPTUAL ESTIMATE	GSF	-	WINDOWS	15.00%
	GRAND RAPIDS, MI	UNITS	-	STOREFRONTS	30.00%
		VSF	-	MASONRY	15.00%
				FIBER CEMENT	40.00%

SITE DEVELOPMENT

INTERIOR FINISHES		NOT INCLUDED			$	-
ROUGH CARPENTRY/GENERAL TRADES		NOT INCLUDED			$	-
LEAN RAILING-CORRIDORS		NOT INCLUDED			$	-
CASEWORK		NOT INCLUDED			$	-
JOINT SEALANTS		NOT INCLUDED			$	-
COMMERCIAL DOORS, FRAMES, AND HARDWARE		NOT INCLUDED			$	-
INTERIOR GLASS		NOT INCLUDED			$	-
DRYWALL AND ACOUSTICS		NOT INCLUDED			$	-
FLOORING		NOT INCLUDED			$	-
TILE SHOWER SURROUNDS		NOT INCLUDED			$	-
TILE BACK SPLASH		NOT INCLUDED			$	-
PAINTING AND WALL COVERING		NOT INCLUDED			$	-
GLASS SHOWER DOORS		NOT INCLUDED			$	-
BATHROOM ACCESSORIES		NOT INCLUDED			$	-
SHELVING		NOT INCLUDED			$	-
MAIL LOCKERS		NOT INCLUDED			$	-
FIRE EXTINGUISHERS		NOT INCLUDED			$	-
TOILET COMPARTMENTS		NOT INCLUDED			$	-
SIGNAGE		NOT INCLUDED			$	-
QUARTZ COUNTERS AND SILLS		NOT INCLUDED			$	-
WINDOW TREATMENTS		NOT INCLUDED			$	-
EQUIPMENT/FURNITURE/SPECIAL CONSTRUCTION					$	-
RESIDENTIAL APPLIANCES		NOT INCLUDED			$	-
POOL		NOT INCLUDED				
TRASH CHUTE		NOT INCLUDED			$	-
TRASH COMPACTOR		NOT INCLUDED			$	-
ELEVATOR		NOT INCLUDED			$	-
SYSTEMS					$	-
FIRE PROTECTION		NOT INCLUDED			$	-
PLUMBING		NOT INCLUDED			$	-
SNOW MELT	1,830	SF	$	33.00	$	60,390
ELECTRICAL/SECURITY/SAFETY		NOT INCLUDED			$	-
SITE WORK					$	-

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TC WEST END APARTMENTS		GENERAL METRICS		ENVELOPE CALC.	
CONCEPTUAL ESTIMATE	GSF	-	WINDOWS	15.00%	
GRAND RAPIDS, MI	UNITS	-	STOREFRONTS	30.00%	
	VSF	-	MASONRY	15.00%	
			FIBER CEMENT	40.00%	

SITE DEVELOPMENT					
TEMPORARY EARTH RETENTION		NOT INCLUDED		$	-
SOIL STABILIZATION		NOT INCLUDED		$	-
SITE DEMOLITION/SESC/GEN CONDITIONS		BY OTHERS		$	-
PREP/SUBBASE FOR SITE IMPROVEMENTS	1	LS	$ 47,325	$	47,325
TEMPORARY CRANE PADS AND ACCESS ROADS		NOT INCLUDED		$	-
FOOTING EXCAVATION AND BACKFILL		NOT INCLUDED		$	-
FOOTING EXCAVATION AND BACKFILL		NOT INCLUDED		$	-
DOMESTIC WATER LINES		NOT INCLUDED		$	-
SANITARY SEWER LINES		NOT INCLUDED		$	-
STORM SEWER LINES		NOT INCLUDED		$	-
RESPREAD TOP SOIL		NOT INCLUDED		$	-
UNDERGROUND STORM WATER DETENTION/PRE-TREATMENT		NOT INCLUDED		$	-
SAND SEPARATOR		NOT INCLUDED		$	-
ASPHALT PAVING		NOT INCLUDED		$	-
SIDEWALKS	4,859	SF	$ 6.75	$	32,798
CONCRETE DRIVEW	259	SF	$ 8.00	$	2,072
CONCRETE WITH SNOWMELT	1,830	SF	$ 12.50	$	22,875
PERMEABLE PAVERS	10,520	SF	$ 22.00	$	231,440
CURB AND GUTTER	955	LF	$ 32.75	$	31,276
RETAINING WALL STRUCTURE		NOT INCLUDED		$	-
RETAINING WALL CLADDING		NOT INCLUDED		$	-
RETAINING WALL RAILING		NOT INCLUDED		$	-
DUMPSTER ENCLOSURE FOOTINGS		NOT INCLUDED		$	-
DUMPSTER ENCLOSURE WALL		NOT INCLUDED		$	-
DUMPSTER ENCLOSURE GATE		NOT INCLUDED		$	-
FENCING		NOT INCLUDED		$	-
SITE FURNISHINGS		NOT INCLUDED		$	-
LANDSCAPING/IRRIGATION	1	ALLOW	$ 50,000	$	50,000
SUB-TOTAL WORK CATEGORIES				**$**	**478,177**
OTHER COSTS					
GENERAL CONDITIONS/PROJECT STAFFING	1	LS		$	28,691
DESIGN/BIDDING CONTINGENCY		12.00%		$	60,824
CONSTRUCTION CONTINGENCY		5.00%		$	28,385

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TC WEST END APARTMENTS		GENERAL METRICS		ENVELOPE CALC.	
CONCEPTUAL ESTIMATE	GSF	-		WINDOWS	15.00%
GRAND RAPIDS, MI	UNITS	-		STOREFRONTS	30.00%
	VSF	-		MASONRY	15.00%
				FIBER CEMENT	40.00%

SITE DEVELOPMENT

DESIGN AND ENGINEERING SERVICES		NOT INCLUDED		
PERMITS & FEES		0.80%		$ 4,769
INSURANCE		0.42%		$ 2,524
HOME OFFICE OVERHEAD		2.00%		$ 12,067
PROFIT		3.00%		$ 18,463
PLM BOND		0.71%		$ 4,501
TOTAL ESTIMATE				**$ 638,399**

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Pioneer CONSTRUCTION	**TC WEST END APARTMENTS**	**GENERAL METRICS**		**ENVELOPE CALC.**	
	CONCEPTUAL ESTIMATE	GSF	-	WINDOWS	15.00%
	GRAND RAPIDS, MI	UNITS	-	STOREFRONTS	30.00%
		VSF	-	MASONRY	15.00%
				FIBER CEMENT	40.00%

SITE DEVELOPMENT

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
GENERAL REQUIREMENTS				$ -
GENERAL REQUIREMENTS	1	LS	$ -	$ -
EXISTING CONDITIONS				
BUILDING DEMOLITION		NOT INCLUDED		$ -
				$ -
SUPER STRUCTURE				
CONCRETE FOOTINGS AND WALLS		NOT INCLUDED		$ -
SLABS ON GRADE		NOT INCLUDED		$ -
ELEVATED SLABS ON METAL DECK		NOT INCLUDED		$ -
STEEL		NOT INCLUDED		$ -
CONCRETE TOPPING SLABS		NOT INCLUDED		$ -
PRECAST CONCRETE		NOT INCLUDED		$ -
GYPCRETE		NOT INCLUDED		$ -
CMU SHAFTS		NOT INCLUDED		$ -
WOOD FRAMING		NOT INCLUDED		$ -
SPRAY APPLIED FIRE PROOFING		NOT INCLUDED		$ -
BALCONIES		NOT INCLUDED		$ -
ENVELOPE				$ -
MASONRY VENEER		NOT INCLUDED		$ -
PATIO RAILINGS		NOT INCLUDED		$ -
GENERAL TRADES		NOT INCLUDED		$ -
SHINGLE ROOFING		NOT INCLUDED		$ -
MEMBRANE ROOFING		NOT INCLUDED		$ -
GREEN ROOFING		NOT INCLUDED		$ -
EIFS		NOT INCLUDED		$ -
FIBER CEMENT SIDING		NOT INCLUDED		$ -
SOFFIT		NOT INCLUDED		$ -
FIBERGLASS RESIDENTIAL WINDOWS		NOT INCLUDED		$ -
EXTERIOR DOORS		NOT INCLUDED		$ -
ALUMINUM FRAMED STOREFRONTS		NOT INCLUDED		$ -
PAINTING		NOT INCLUDED		$ -
OVERHEAD DOORS		NOT INCLUDED		$ -

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Pioneer CONSTRUCTION	TC WEST END APARTMENTS	GENERAL METRICS		ENVELOPE CALC.	
	CONCEPTUAL ESTIMATE	GSF	-	WINDOWS	15.00%
	GRAND RAPIDS, MI	UNITS	-	STOREFRONTS	30.00%
		VSF	-	MASONRY	15.00%
				FIBER CEMENT	40.00%

SITE DEVELOPMENT

INTERIOR FINISHES		NOT INCLUDED			$	-
ROUGH CARPENTRY/GENERAL TRADES		NOT INCLUDED			$	-
LEAN RAILING-CORRIDORS		NOT INCLUDED			$	-
CASEWORK		NOT INCLUDED			$	-
JOINT SEALANTS		NOT INCLUDED			$	-
COMMERCIAL DOORS, FRAMES, AND HARDWARE		NOT INCLUDED			$	-
INTERIOR GLASS		NOT INCLUDED			$	-
DRYWALL AND ACOUSTICS		NOT INCLUDED			$	-
FLOORING		NOT INCLUDED			$	-
TILE SHOWER SURROUNDS		NOT INCLUDED			$	-
TILE BACK SPLASH		NOT INCLUDED			$	-
PAINTING AND WALL COVERING		NOT INCLUDED			$	-
GLASS SHOWER DOORS		NOT INCLUDED			$	-
BATHROOM ACCESSORIES		NOT INCLUDED			$	-
SHELVING		NOT INCLUDED			$	-
MAIL LOCKERS		NOT INCLUDED			$	-
FIRE EXTINGUISHERS		NOT INCLUDED			$	-
TOILET COMPARTMENTS		NOT INCLUDED			$	-
SIGNAGE		NOT INCLUDED			$	-
QUARTZ COUNTERS AND SILLS		NOT INCLUDED			$	-
WINDOW TREATMENTS		NOT INCLUDED			$	-
EQUIPMENT/FURNITURE/SPECIAL CONSTRUCTION					$	-
RESIDENTIAL APPLIANCES		NOT INCLUDED			$	-
POOL		NOT INCLUDED				
TRASH CHUTE		NOT INCLUDED			$	-
TRASH COMPACTOR		NOT INCLUDED			$	-
ELEVATOR		NOT INCLUDED			$	-
SYSTEMS					$	-
FIRE PROTECTION		NOT INCLUDED			$	-
PLUMBING		NOT INCLUDED			$	-
SNOW MELT	3,877	SF	$	33.00	$	127,941
ELECTRICAL/SECURITY/SAFETY		NOT INCLUDED			$	-
SITE WORK					$	-

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Pioneer CONSTRUCTION	TC WEST END APARTMENTS	GENERAL METRICS		ENVELOPE CALC.	
	CONCEPTUAL ESTIMATE	GSF	-	WINDOWS	15.00%
	GRAND RAPIDS, MI	UNITS	-	STOREFRONTS	30.00%
		VSF	-	MASONRY	15.00%
				FIBER CEMENT	40.00%

SITE DEVELOPMENT

TEMPORARY EARTH RETENTION		NOT INCLUDED		$ -
SOIL STABILIZATION		NOT INCLUDED		$ -
SITE DEMOLITION/SESC/GEN CONDITIONS		BY OTHERS		$ -
PREP/SUBBASE FOR SITE IMPROVEMENTS	1	LS	$ 14,633	$ 14,633
TEMPORARY CRANE PADS AND ACCESS ROADS		NOT INCLUDED		$ -
FOOTING EXCAVATION AND BACKFILL		NOT INCLUDED		$ -
FOOTING EXCAVATION AND BACKFILL		NOT INCLUDED		$ -
DOMESTIC WATER LINES		NOT INCLUDED		$ -
SANITARY SEWER LINES		NOT INCLUDED		$ -
STORM SEWER LINES		NOT INCLUDED		$ -
RESPREAD TOP SOIL		NOT INCLUDED		$ -
UNDERGROUND STORM WATER DETENTION/PRE-TREATMENT		NOT INCLUDED		$ -
SAND SEPARATOR		NOT INCLUDED		$ -
ASPHALT PAVING		NOT INCLUDED		$ -
SIDEWALKS	-	SF	$ 6.75	$ -
CONCRETE DRIVEW	1,524	SF	$ 8.00	$ 12,192
CONCRETE WITH SNOWMELT	3,877	SF	$ 12.50	$ 48,463
PERMEABLE PAVERS	-	SF	$ 22.00	$ -
CURB AND GUTTER	-	LF	$ 32.75	$ -
RETAINING WALL STRUCTURE		NOT INCLUDED		$ -
RETAINING WALL CLADDING		NOT INCLUDED		$ -
RETAINING WALL RAILING		NOT INCLUDED		$ -
DUMPSTER ENCLOSURE FOOTINGS		NOT INCLUDED		$ -
DUMPSTER ENCLOSURE WALL		NOT INCLUDED		$ -
DUMPSTER ENCLOSURE GATE		NOT INCLUDED		$ -
FENCING		NOT INCLUDED		$ -
SITE FURNISHINGS		NOT INCLUDED		$ -
LANDSCAPING/IRRIGATION	1	ALLOW	$ 50,000	$ 50,000
SUB-TOTAL WORK CATEGORIES				**$ 253,228**
OTHER COSTS				
GENERAL CONDITIONS/PROJECT STAFFING	1	LS		$ 15,194
DESIGN/BIDDING CONTINGENCY		12.00%		$ 32,211
CONSTRUCTION CONTINGENCY		5.00%		$ 15,032

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TC WEST END APARTMENTS		GENERAL METRICS		ENVELOPE CALC.	
CONCEPTUAL ESTIMATE	GSF	-		WINDOWS	15.00%
GRAND RAPIDS, MI	UNITS	-		STOREFRONTS	30.00%
	VSF	-		MASONRY	15.00%
				FIBER CEMENT	40.00%

SITE DEVELOPMENT

DESIGN AND ENGINEERING SERVICES		NOT INCLUDED		
PERMITS & FEES		0.80%		$ 2,525
INSURANCE		0.42%		$ 1,336
HOME OFFICE OVERHEAD		2.00%		$ 6,391
PROFIT		3.00%		$ 9,777
PLM BOND		0.71%		$ 2,383
TOTAL ESTIMATE				**$ 338,077**

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SECTION 3

ESTIMATE CLARIFICATIONS AND ASSUMPTIONS

TC WEST END APARTMENTS

Program Estimate of Probable Cost

Estimate Clarifications and Assumptions

1.0 **Purpose** – The purpose of this document is to list the assumptions and clarifications used in the preparation of this estimate.

2.0 **Means and Methods –** Because this estimate is based on program information, and plans, building elevations, or renderings the estimate is to be considered representative in nature. We have identified the expected line items of cost that would be found in projects similar to this, and our estimated values are based on historical data for the same.

3.0 **Drawings and Specifications** – Pioneer Construction has evaluated the documents and program information included in the plans dated 04/07/2023 prepared by Fishbeck.

4.0 **Building Gross Square Footage –** The Gross Square Footage ("GSF") listed in this document is based on the American Institute of Architects (AIA) Document D101, Architectural Area and Volume of Buildings, 1995 Edition, excluding areas defined as ½ area (canopies, soffits, etc.) which at this point are undetermined. The areas shown below were taken from the project program provided with the RFP.

1)	A-B Building	21,741 GSF
2)	Liner Building	51,051 GSF
3)	Mobility Fit-Out	1,700 GSF
4)	Parking Garage	178,066 GSF
5)	Total Project	250,858 GSF

5.0 **Bonding** – This estimate includes costs associated with payment and performance bonds. Performance and payment bonds for subcontractors are included in the estimated value of their work. PLM bond for the CM is listed as a separate value based on the estimated cost of the contract.

6.0 **Contingency** – the following contingency line items apply to the estimate and are included.

6.1 **Design and Bidding Contingency** – This estimate includes a design and bidding contingency which is to be used for the following: 1) unforeseen changes in the assumed scope of work because of specific details developed as design proceeds; 2) unforeseen changes in market conditions; 3) non-negligent errors and omissions in the construction documents; 4) Changes in program; 5) insufficient information in the documents when the estimate was prepared. As design is completed, it is anticipated that this contingency is absorbed into the cost of the work and into individual line items of cost.

6.2 **Construction Contingency** - This estimate includes a Construction Contingency for the Construction Manager's exclusive use. Unless agreed to by the Construction Manager or otherwise provided in the Contract Documents, the Construction Contingency shall not be used by the Owner to fund scope increases, design changes and/or costs related to concealed or unknown conditions. In turn, the Construction Manager's Construction Contingency shall not be used to cover items resulting from the Construction Manager's gross negligence unless provided for below. The contingency may be used for the following, but is not limited to: (i) items of Work within the scope of the Master Agreement, but due to the Construction Manager's error failed to be included in a Subcontract: (ii) additional costs incurred as a result of a failure of a bidder to whom a portion of the Work is awarded in accordance with the Master Agreement to enter into a subcontract with the Construction Manager; (iii) unanticipated market conditions and material conditions; (iv) casualty losses and related expenses uncompensated by insurance or otherwise and sustained by the Construction Manager in connection with the Work, except to the extent such losses or expenses are attributable, in whole or in part, to the Construction Manager's negligence; (v) costs arising from default of un-bonded and uncollectible Subcontractors; (vi) subcontract buyout errors: (vii) errors and omissions in estimating and (viii) deductibles owned by the Construction Manager per the terms of the Master Agreement for claims insured by Builder's Risk Insurance.

6.3 **Owner Contingency** – This estimate does NOT include the Owner's Contingency and includes no costs associate therewith.

7.0 **Sales Tax** – this estimate assumes a sales tax rate of 6% associated with State of Michigan sales tax.

8.0 **Allowances –** Allowances identified in this estimate unless otherwise provided in the Contract Documents shall cover:

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8.1 The cost to the Construction Manager of materials and equipment delivered at the site and all required taxes, less applicable trade discounts.

8.2 Construction Manager's cost for unloading and handling at the site labor, installation costs, overhead, profit and other expenses contemplated for the stated allowance amounts shall be included in the Contract Sum but not in the allowances; and

8.3 Whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 8.1 and (2) changes in Construction Manager's costs under Section 8.2

9.0 Labor Rates – This estimate is based on local labor wage rates in an open shop. ***No prevailing wages are included in the estimate.***

10.0 Changes in Laws – Notwithstanding anything in the Contract Documents to the contrary, it is expressly acknowledged and agreed upon by the parties that in the even any law, ordinance, rule, code or regulation applicable to the Project is changed after the date this Contract is executed by the Construction Manager, and the change increases the Construction Manager's time or cost of performance of the Work, the Construction Manager shall be entitled to Change Order equitably adjusting the Contract Sum and Contract Time accordingly.

11.0 Inflation / Market Escalation – The estimate for this project is based on current prices for the materials, supplies, equipment, and labor. However, the market for materials is volatile and sudden increases could occur. If after submission of the GMP Amendment, the price of materials or labor significantly increases, thorough no fault of the Construction Manager, the Contract Sum shall be equitably adjusted via Change Order by an amount reasonably necessary to cover any such significant price increases. As used herein, a significant price increase shall mean a 5% or greater difference in the price or estimated price of materials, equipment or supplies at the time of the execution of the GMP Amendment and the price of the specified material, supplies and/or equipment at the time which it is purchased by the Construction Manager and/or subcontractor. Such price increases shall be documented through dated quotes, invoices, or receipts.

12.0 Audit - some categories of the Construction Manager's costs are incurred on a company-wide basis and therefore cannot be precisely allocated to this Agreement. In order to reduce the costs of further review and audit of the Construction Manager's records related to the Cost of the Work, the parties have or will agree to certain fixed prices, rates, or percentages in the Contract Documents as a good faith agreement on those categories of Cost of the Work and therefore agree to waive further review, audit or adjustment of the agreed fixed prices, rates, or percentages.

13.0 Construction Materials Availability – The Contract and GMP Amendment assume that the construction materials specified and required for this Project are procurable and available to meet the Construction Schedule. Where the delivery of materials is delayed or labor availability is impacted, through no fault of the Construction Manager, as a result of the shortage or unavailability of materials or labor, Construction Manager shall not be liable for any additional costs or damages associated with such delay(s) and shall be entitled to an equitable adjustment of the Contract Time.

14.0 Consequential Damages – In no event shall the Owner or Construction Manager be liable to the other for consequential, punitive, exemplary, or indirect damages of any kind.

15.0 Construction Schedule – The estimate is based on comparative historical data and not tied specifically to a construction schedule. The construction start date and substantial completion date are yet to be determined and will be based on the development of the project plans and documents.

16.0 Clarifications – The following clarifications are outlined to coincide with the Program Estimate.

1) All services performed by others (inspections, testing, etc.) in support of the work shall be made available without cost to the Construction Manager.
    a. The Owner shall furnish surveys describing physical characteristics, legal limitations, and utility locations for the site of the Project, and a written legal description of the site.
    b. The Owner, when such services are requested, shall furnish services of geotechnical engineers, which may include test borings, test pits, determinations of soil bearing values, percolation testes, evaluations of hazardous materials, seismic evaluation, ground corrosion tests and resistivity tests, including necessary operations for anticipating subsoil conditions, with written reports and appropriate recommendations.
2) This Estimate is based on a (1) year warranty of the Work after acceptance or turnover to the Owner Substantial Completion of the Work (unless exceeded by requirements identified in the specifications or Contract Documents.)

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3) Construction requirements for Americans with Disabilities Act (ADA) shall be clearly identified and shown on the construction drawings and specifications. At program level, the estimate assumes that ADA requirements apply to this project, but at GMP our estimated cost will make no assumptions beyond the information shown on the documents.
4) The program level estimate assumes that the final documents be code compliant. At GMP the estimate makes no assumptions for code related work beyond that shown on the plans and specifications.
5) The estimate does not include any premiums to meet MWBE contract participation goals. Pioneer will implement best and good faith efforts to maximize inclusion in purchasing.
6) The estimate assumes that the residential buildings will be constructed of conventional steel with hollow core plank for floor structure.
7) The estimate assumes that all building pads for all structures will be prepped and ready for footing excavation.
8) The estimate assumes that all mass grading will be completed and all spoils will either be hauled off and brought in and spread.
9) The estimate assumes that all existing structures will be demolished.

17.0 **Exclusions:** The following items are excluded from our estimate:

a. Design and Engineering
b. Owner Contingencies
c. Road Closure Fees
d. Materials Testing and Special Inspection Fees
e. Water Meter Fees and associated assessments
f. Food Service Equipment (we have included costs for residential appliances)
g. Soil Borings and Geotechnical Reports
h. Costs for soil stabilization, improvements, or deep foundations
i. Dewatering
j. Disposal of Contaminated Soils
k. Asbestos Surveys or Abatement
l. Vapor Intrusion Mitigation
m. Property Boundary Surveys or final as-built surveys
n. Public Utility Fees
o. Commissioning Fees
p. LEED administration or Third-Party Fees

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Appendix 6

Utility Services Comparison
Conventional vs. Electric Only

fishbeck
Engineers | Architects | Scientists | Constructors

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Technical Memo No. 1

SUBJECT: Traverse City West End Mixed-use Development
Utility Services Comparison – Conventional Approach vs. Electric Only Approach

DATE: January 19, 2024 PROJECT NO.: 231082

Introduction

The intent of this technical memo is to compare a conventional approach vs. electric only approach regarding utility services (energy sources) serving the proposed parking structure.

A conventional approach is where both a natural gas service and electrical service is provided for the parking structure. The electric only approach includes an electrical service only, without a natural gas service.

The main focus for this comparison is the energy source for the snow melt system, electrical service size, and on-site back-up power systems. Assumptions are indicated in the following paragraphs. Note, this comparison does not include first costs or operational costs for the following systems, as it is assumed that these systems will likely be the same for either approach: Interior lighting for the parking structure, electric vehicle charging stations, electric space heating for small rooms, or hydronic pumping and piping systems related to snow melt.

Conventional Approach

Natural gas service is used as the main heating source for snow melt system equipment. Specifically, gas-fired boilers to heat the glycol fluid that is pumped through the system to transfer heat to the melt areas.

Natural gas service is also used as a power source for on-site generator for back-up power for emergency lighting (emergency) and elevators (legally required) and Owner communication systems (optional standby). On-site emergency and legally required are code required. Optional standby systems are important items for the Owner's operation of a parking structure, but not code required.

Electric Only Approach

Electric service is used as the main heating source for snow melt system equipment. Specifically, electric boilers to heat the glycol fluid that is pumped through the system to transfer heat to the melt areas.

A natural gas generator or diesel generator will not be allowed. This approach utilizes three separate uninterruptible power supply (UPS) systems located in dry and conditioned interior rooms. One UPS for each of the two elevators and one UPS for emergency lighting. Each UPS system will include its own dedicated set of sealed VRLA (valve regulated lead acid) type batteries installed in a battery cabinet. Estimated useful life of these batteries is five years. Equipment costs provided by Mark Miersen of Hedrick, a UPS equipment supplier.

Operational (Energy Costs)

- Snowmelt System Size: 35,000 sf (surface area to include snowmelt)
- Snowmelt heat output 170 btuh/sf (50 W/sf) for melting
  - Hours Snowing (Melting) Time/Year: Assume 350 hours. For this comparison, preheating concrete slabs/surfaces known as idling was not used. During a snow or ice event, the snow melt system turns on and goes to full heat.
- Electric Rate:
  - $15.15 per kW demand
  - $.06/kWh, Traverse City Light and Power
- Gas Rate: $ .765/CCF for non-residential gas service
- Annual Energy Consumption Melting per sf: 60,000 btuh/sf (17,500 Wh/sf)
- Annual Energy Consumption Melting: 20600 CCF (612,500 kWh)

System First Costs

Description	Conventional Approach	Electric Only Approach
Snowmelt System		
Gas-Fired Boilers (Equipment Costs Only)	$450,000	N/A
Electric Boiler(s) (Equipment Costs Only)	N/A	$400,000
Main Electrical Service Cost and Preliminary Service Size	$ 75,000 800A, 480V, 3 phase, 4 wire	$ 215,000 3,000A, 480V, 3 phase, 4 wire
Snowmelt System Total	$525,000	$615,000
On-site Backup (Emergency) Power		
Generator, Automatic Transfer Switches, and related equipment	$275,000	N/A
Three UPS Systems for Elevator 1, Elevator 2, and Emergency Lighting (Equipment Costs Only, does not include lifting, setting in-place, labor, and installation)	N/A	$470,000
On-site Backup Power Total	$275,000	$470,000
Equipment Useful Life		
Mechanical Equipment:		
Gas Fired Boiler	25 years	
Electric Boilers		15 years
Electrical Equipment:		
Generator and transfer switches	25 years	
UPS Systems		15 years
Batteries for UPS Systems		5 years

Snow Melt System Energy Costs to Operate

Description	Conventional Approach	Electric Only Approach
Annual Energy Costs Melting	$ 15,759	$ 36,750
Annual Energy Miscellaneous Costs	$ 3,000*	$140,000 demand charge ($28,000 x 5 months)
Total	$ 18,759	$ 176,750

** Includes surcharges, taxes, etc.*

Observations and Summary – Parking Structure

There is a premium for providing all electric equipment.

- First Cost Premium $285,000 (order of magnitude).
- Annual Energy Costs Premium, $158,000 per year (order of magnitude).
- Equipment Lifespan & Replacement:
  - Replace electric boilers and UPS systems every 15 years versus 25 years for conventional gas-fired equipment.
  - Replace UPS batteries recommended every five years. Some industry sources may indicate battery life of 10-years, but batteries would suffer diminished performance and obsolescence over that extended lifetime.

Adjacent, Mixed-use Buildings

A similar evaluation was performed by Nealis Engineering for the adjacent, mixed-use buildings. Refer to the attached summary table for their results.

Observations and Summary – Adjacent, Mixed-use Buildings

There is a premium for providing all electric equipment.

- First Cost Premium $161,000 (order of magnitude).
- Annual Operation and Maintenance Costs Premium $7,100.
- Equipment Lifespan and Replacement: Batteries require replacement every 10-years (maximum).

	Backup power for Liner Building Elevator						
	Generator & ATS			Uninterruptible Power Supply			
First Costs	Mechanical	Electrical	Total	Mechanical	Electrical	Total	
--equipment		$60,000.00	$60,000.00		$225,000.00	$225,000.00	No variation in electrical service size
--gas piping/meter	$15,000.00		$15,000.00				Cost varies greatly on location and placement of gas meter & equipment
Maintenance Costs							
--yearly maintenance		$2,500.00	$2,500.00		$9,500.00	$9,500.00	
-- battery replacements every 10 years		$200.00	$200.00		$30,000.00	$30,000.00	
Operational Costs / year	$600.00		$600.00				
	Snow Melt for Building A/B sidewalk along Pine Street						
	Gas-fired Boiler			Electric Boiler			
First Costs	Mechanical	Electrical	Total	Mechanical	Electrical	Total	
--equipment	$12,000.00	$4,000.00	$16,000.00	$30,000.00	$7,000.00	$37,000.00	No variation in electrical service size
--gas piping/meter	$10,000.00		$10,000.00				Cost varies greatly on location and placement of gas meter & equipment
Operational Costs / year			$400.00			$1,100.00	
Maintenance Costs / year	*Same between systems*						

Appendix 7

Rendered Site Plan

West End Mixed-Use Development - Site Plan



LEGEND

1. State Street Linear Building
2. A-B Building
3. Parking Structure
4. Sidewalk with Snowmelt System
5. Alley Pavement (Concrete or Permable Pavers)
6. Pedestrian Crossing
7. Stair Access
8. Stair and Elevator Access
9. Alley Gateway Signage
10. Vehicular Entry and Exit

Traverse City, Michigan

Traverse City - Downtown Development

CORNERSTONE ARCHITECTS

fishbeck